The Effectiveness of Schooling: Variation in Attainment Among Schools and Among Educational Sectors

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Abstract

This thesis investigates the variation in the effectiveness of Scottish secondary schools. The data employed comprise information collected by self-completion questionnaires from a random sample of 38 percent of the pupils who left school in the 1979/80 session. They contain reports of information on pupil social background and on the attainment of pupils in the public examinations conducted by the Scottish Examination Board for the Scottish Certificate of Education. While the surveys also collect additional information on post-school destinations, and school experiences, this work analyses only the data relating to school processes, in relation to pupil background characteristics and attainment.

The study investigates the variation in the effectiveness of schools, and develops statistical models of the relationship of school processes to the effectiveness of schools. Further, the variation in effectiveness among educational sectors defined by the denomination of schools, the era in which schools were established, the types of community which they serve, and the Local Educational Authorities through which they are administered and governed is investigated.

The methodology employed is based on recent advances in the statistical modelling of data on schooling. Previous statistical methods are shown to be inadequate and the emerging methodology of multilevel modelling is employed to analyse the variation among schools and among educational sectors. The major benefit of this new methodology is its representation of the relationships between school-level processes and characteristics on the one hand, and pupil-level relationships between their social background and attainment on the other. More explicitly, the methodology provides a basis for modelling the mean attainment of schools, and the variation in the slope for the regression of attainment on the social background characteristics of pupils across schools.

Acknowledgements

For the purposes of the regulations I hereby declare that it am the sole author of the material presented herein. However, the development of the ideas and arguments is deeply indebted to the many stimulating discussions that I have had with other researchers and colleagues over a long period, not to mention the published works of numerous scholars.

The development of my ideas on the effectiveness of schooling owes much to the discussions that I have had with Cathy Garner, Andrew McPherson, David Raffe, and Doug Willms, my colleagues at the Centre for Educational Sociology. Others outside of the Centre who have had a formative influence on my thinking in this area include Charles Bidwell, Leigh Burstein, James Coleman, Robert Dreeben, John Gray, George Madaus, and David Reynolds.

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The development of my ideas on the presentation of the statistical graphics in this work owes much to discussions with a wide range of individuals both here at this university and during my visits to the United States.

The data which is analysed in this work has been collected, cleaned, coded, and made ready for research by a team of survey and computing staff too large to mention individually. With an operation of this size it is impossible to even know who has made a direct contribution, but their efforts are recognised and appreciated, for they form the foundation of a research enterprise such as the present.

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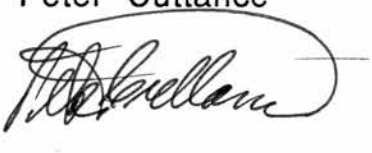
Peter Cuttance



Chapter 1

Overview

Research on variation in the effectiveness of schooling can essentially be traced back to the Coleman report (Coleman *et al*,1966). During the decade that followed several other reports on the effectiveness of schooling were also published. In the US there were further studies by Jencks *et al* (1972) and Jencks and Brown (1975), in addition to various reanalyses of the data collected for the Coleman Report. The concerns of the Plowden Report (1966) and the Karmel Report (1973) in the UK and Australia, respectively, paralleled those of the Coleman Report. These reports sought to assess the impact of schools on pupil attainment and thereby to locate aspects of schooling which act as agents of social change along lines that would lead to greater educational and social equality.

These reports did not express a direct interest in the variation between school sectors as independent variables, rather they treated the information on school type, school location, etc, as covariates to be controlled for before assessing the impact of particular policy related variables on pupil outcomes. Research on effective schooling since then has continued to treat information on school types as covariate information, and has focussed on variations in school characteristics, ignoring the sectorial nature of the school system. Studies of the differences in performance between the public and private schools in the US (Coleman,Hoffer and Kilgore, 1983) and comprehensive and selective schools in the UK (Steadman, 1980, 1983; Gray *et al*,1983) have, however, sought to treat information on school types as the independent variable in the analysis, that is, to explicitly recognise the sectorial nature of the system. Raudenbush and Bryk (1987) have shown that studies that fail to take account of sectorial variation are likely to underestimate the degree of pupil-level variation in outcomes that can be attributed to schools and sectors, and overestimate the influence

of pupil background factors, such as social class and prior attainment

Chapter 2 provides a synthesis of the research on effective schooling. The changing social and economic context of schooling over the last decade, and an assessment of the implications of impending demographic changes in the secondary school population over the coming decade are discussed. Research on the influence of school resources and management, school ethos and climate, and curriculum and instruction is then synthesised in the context of the educational concerns raised by the previous discussion of the changing context of schooling.

Chapter 3 presents an analysis of research on variation in attainment among educational sectors. This chapter focuses on the extensive debate that has ensued since the publication of the study of the relative effectiveness of public and private schooling in the United States by James Coleman and his colleagues (Coleman, Hoffer, and Kilgore, 1983), and upon recent British research on differences in the performance of pupils in selective and comprehensive schools. In addition to reporting the findings of the various studies in some detail, methodological and conceptual issues in the analysis of data on pupil performance in intact systems are discussed. Of principal interest here are issues of the selective nature of school intakes, the multidimensionality of any typology of school sectors, the appropriateness of various measures of school outcomes, and the type of variation in pupil attainment that is of interest in such studies.

Previous studies of sector differences have generally approached the issue from the standpoint of evaluation methodologies for assessing treatment effects of policy interventions in educational research (Boruch and Cordray, 1980; House, 1986). The definition of sectors has derived from the policy related treatment under study. The present study, however, seeks to address the issue of sectorial variation in the context of the literature on school effectiveness, rather than

from a policy evaluation standpoint. The specific objective of the current research is to assess the extent and nature of variation that lies between schools within sectors and between sectors, as a means to assessing whether sector-level variation is associated with factors that influence the effectiveness of schools. The data available to the present study do not contain detailed information on variation in school policies and practices, but the potential of sector-level variation in such factors to explain school effectiveness can be assessed through the analyses proposed. Recent research in the US (Coleman and Hoffer, 1987) has argued that school effectiveness is associated with the characteristics of communities. In particular, they have argued that schools serve a function of confirming and supporting the values of communities and that this results in greater congruence between school norms and values and the values of the community, which in turn is hypothesised to affect the effectiveness of schools across a range of pupil outcomes. Communities in this context may be viewed as either geographically and socially bounded or as networks of families who share similar value orientations. McPherson (1983) has shown that variation in teacher promotion patterns were community related over a period of several decades this century. This is *prime facie* evidence that the characteristics of communities may be related to the effectiveness of Scottish schools.

Since the perspective taken here is not that of policy evaluation, but rather one of assessing the variation in the structure of the education system as it has evolved through developments over the past century, an historical analysis of the development of the system is employed as the basis for defining a set of typologies of educational sectors. Chapter 4 presents an account of some of the main features of the development of the system from this perspective. It deals principally with the system of schools as it evolved to provide education for an increasing proportion of the age cohort, and as the age of compulsory schooling was raised from thirteen years at the

establishment of the state funded system in 1872 to the age of sixteen years that prevails today. The evolution of this system reflects the various attempts to meet specific community needs and the variation in policies as they were implemented in different geographical and administrative areas. Specific attention is given to two dimensions of the sectorial structure of schooling that have been shown by McPherson and Willms(1986) to be associated with variation in the effectiveness of schooling in Scotland. That study found that Catholic schools were more effective than their non-denominational counterparts, and that schools founded in the earlier phases of the development of the school system were more effective than those founded more recently.

Methodologically, most studies of effective schooling have not recognised and dealt with the multi-level nature of the education system. In particular, studies of the performance of pupils among sectors have failed to incorporate schools into their analyses. They have generally ignored the fact that pupils are clustered within schools, and that schools are clustered within sectors. The reasons for this are twofold. First, the data available has usually contained relatively few pupils within each school, which has inhibited the accurate estimation of the variation in pupil-level variation that lay within-schools, between-schools, and between-sectors. Second, the statistical tools for conducting such analyses have not been widely available. Variation at each level in the system may reflect both variation in levels of pupil attainment and variation in the relationship between attainment and pupil background characteristics among units at lower levels. Thus, it may not be sufficient to assume that the same model of variation holds in every school. The recent development of multi-level statistical modelling methods, now allow for the simultaneous modelling of the education system at several levels. The main implication of the development of these methods for assessing the nature of the variation between sectors lies in the more efficient estimates of sector effects and variation that they afford. The work that has

previously ignored the school as a factor in assessing variation between sectors failed to consider differences other than those associated with the estimated mean performance of sectors. The models employed have been statistically inefficient, which suggests that hypothesis testing related to the evaluation of sector differences may have led researchers to incorrect conclusions. A discussion of these methodological issues and the development of a statistical model for the analyses presented in later chapters are presented in chapter 5.

Chapter 6 presents an account of the data capture and measurement procedures. The data employed in this study is drawn from the 1981 Scottish School Leavers Survey. Only a synoptic discussion of the particulars of the conduct of these surveys is provided as they have been fully documented elsewhere (Burnhill, 1984). The chapter discusses the particular data and variables that are employed in the empirical analyses. The variables discussed include: the three attainment measures and the scaling of these; the social background measures; the measures of school process, and the basis on which these are aggregated to provide composite measures for each school; and the indicators of school sector membership.

Chapter 7 analyses the structure of variation in the set of school-level process constructs that are developed from items in the pupil questionnaire. The purpose of this analysis is to assess the potential of these measures for explaining variation in effectiveness between schools. A set of school process constructs relating to the instructional environment of schools, and to the influence of 'significant others' on pupil attainment are developed for use in later chapters. The relationship between these school process constructs and characteristics of the social class composition of schools is also analysed. This analysis is presented in the context of the debate in the literature as to whether the composition of school intakes is a valid proxy measure of school processes, or whether it represents selection effects otherwise omitted from the models.

Chapter 8 presents an evaluation of the extent of variation in the effectiveness of post-primary schooling in Scotland. It assesses the range of variation between schools, the proportion of variation in pupil-level outcomes that lies between schools, and the dimensionallity of between-school variation in pupil-level outcomes across cognitive domains. The range of variation between schools indicates the difference between the most effective and the least effective schools; the proportion in pupil-level outcomes that lies between schools indicates the maximal degree of variation that could be associated with higher-level sectors of the school system; and the dimensionallity of school effectiveness across cognitive outcomes indicates the extent to which the effectiveness of schools is consistent across cognitive outcomes.

Chapter 9 presents an analysis of the variation in the effectiveness of schools for three of the sectorial typologies developed in chapter 2. The three typologies of sectorial variation in the school system that form the basis of the investigation in that chapter are those relating to the selectivity of schooling, the type of community in which schools are located, and the administrative units through which schooling is governed. Variation in the effectiveness of the sectors within each of these typologies is assessed for the system of secondary schools that existed in the mid-seventies.

Chapter 10 presents an analysis of the variation in the effectiveness of Catholic and non-denominational sectors. The relationship of differentials in effectiveness between these sectors to variation in the social class composition of schools and of variation in school process is investigated.

Chapter 11 presents a similar investigation of the differentials between sectors for schools founded at the various stages in the development of the system. Together, chapters 10 and 11 provide a detailed investigation of the differentials between sectors that were reported by McPherson and Willms (1986), and of the power of the school process and composition

measures to account for these differentials in attainment between sectors.

Chapter 12 integrates the findings of the previous five chapters into a unified model that explains the variation in school effectiveness in these data. It focuses on the development of an *instructional effects* model which incorporates selected measures of school process, school intake characteristics, and the sectors that schools belong to, into a single explanatory model of the variation in quality and equity among schools.

Chapter 13 discusses the findings and their implications for sector related explanations of variation in the effectiveness of schooling in the light of current policy initiatives that are likely to create greater diversity among schools.

Chapter 2

A Synthesis of Research on the Effectiveness of Schooling

Introduction

The research literature on the effectiveness of schooling is of a comparatively recent vintage. Its seminal source can be traced back to the reports on equality of educational opportunity produced in many countries in the late 60s (cf.Plowden, 1966; Coleman *et al,*1966). Since then the focus of research has shifted away from equality of opportunity to the characteristics of schools which are associated with differences in pupil outcomes between schools. The 'equality of opportunity' research concluded that since substantially more of the variation in pupil outcomes was associated with the social background of pupils, major efforts to equalise outcomes should be located in non-school aspects of pupil educability. Hence, the rise of large scale programmes of education aimed at socially deprived children in the pre-school population during the early 70s. Some of this effort was also displaced into schooling and resulted in the allocation of additional resources for schools in areas of social deprivation.

The belief, that prevailed throughout the 70s, that "schools don't have much influence on differences in outcomes between pupils" was based on the finding that most of the variation in pupil outcomes, even when their social background was taken into account, was not associated with differences between schools. In the late 70s there was a resurgence of research in the idea that some schools may be more effective, particularly for children from deprived backgrounds. This interest led to the search for schools which appeared to be performing above expectation. Researchers then studied these schools for exemplary features which could be transferable to other schools. The study by Rutter *et al* (1979) of twelve Inner London comprehensives is the only British study to adopt an approach along these lines. The main difference between

this study and its early US counterparts was that the Rutter study did not select schools on the basis of their performance, but studied all schools for a sample of children who had been part of an earlier child development study. In studying all schools, rather than just those thought to have a high level of performance (*outlier* schools), the Rutter study is similar in design to another conducted during the same period in the US (Brookover *et al,*1979). Other research has been conducted as single case studies of outlier schools. This latter work has been severely criticised on methodological grounds because of a lack of rigour in designating which schools were outliers in terms of pupil performance (Purkey and Smith, 1983; Ralph and Fennessey, 1983; Rowan, Bossert, and Dwyer, 1983). The argument centres around the failure of many studies to adequately control for the composition of school intakes, hence outlier schools may have merely reflected the more advantaged intakes of those schools. There is also the question of whether schools which appear to perform well in terms of one outcome measure also perform well on other outcomes, and hence whether the studies were focusing on the wrong level (school rather than classroom or curriculum department) as the source of exceptional school performance on a given outcome. Because they investigated several schools and controlled for their intakes, the Rutter and Brookover studies do not suffer from these particular problems, although they have methodological weaknesses of their own (Cuttance, 1980a; Goldstein 1984; Purkey and Smith, 1983; Ralph and Fennessey,1983). A significant problem with studies that are conducted on a small group of schools is the extrapolation of findings to the wider population of all schools. Unless the schools chosen are in some sense representative of the population of all schools, or the findings are corroborated across studies of different types of schools, it is difficult to know how findings about effective practices might transfer to other schools (Cuttance, 1985a).

Perhaps the most significant feature of the school effectiveness literature over the last two decades is its focus on factors constant at the school level, as opposed to factors which

are constant lower down in the hierarchy, say, in the classroom. Thus, factors whose influence is located within classrooms but also constant across all classrooms within a school are interpreted as school factors, whereas those which are located at the classroom-level but which vary from classroom to classroom within schools have generally not been treated as factors which influence the effectiveness of schools. This school-level orientation in the literature limits the range of factors considered to influence the effectiveness of schools. In particular, it means that much of the teacher effectiveness, instructional methods, and curriculum research literature has not been taken on board by school effectiveness research.

The remainder of this chapter is divided into three parts. The first presents an overview of issues raised in the literature on effective schooling. It argues that each era ushers in its own set of concerns and research and policy issues, therefore the research literature from a previous era may not address the issues of interest in present or future eras. The principal issues for the effectiveness of schooling in the previous two decades are introduced alongside those of the present decade. The claims of each of the relevant research traditions relating to the effectiveness of schooling are discussed in relation to their theoretical frameworks and these are linked to current policy and research debates. This, however, does not necessarily uncover the issues which will emerge for the effectiveness of schooling in the 1990s.

In order to set the context of schooling over the coming decade the second part presents data on demographic trends and the use of resources over the last decade and a half, and makes projections for these for the next decade. The two decades between 1975-1995 will witness substantial changes in expansion and contraction in the school system.

The third part then synthesises the literature on the effectiveness of schooling in terms of resources, management,

school ethos and climate, and salient features of the literature on the effectiveness of instructional methods.

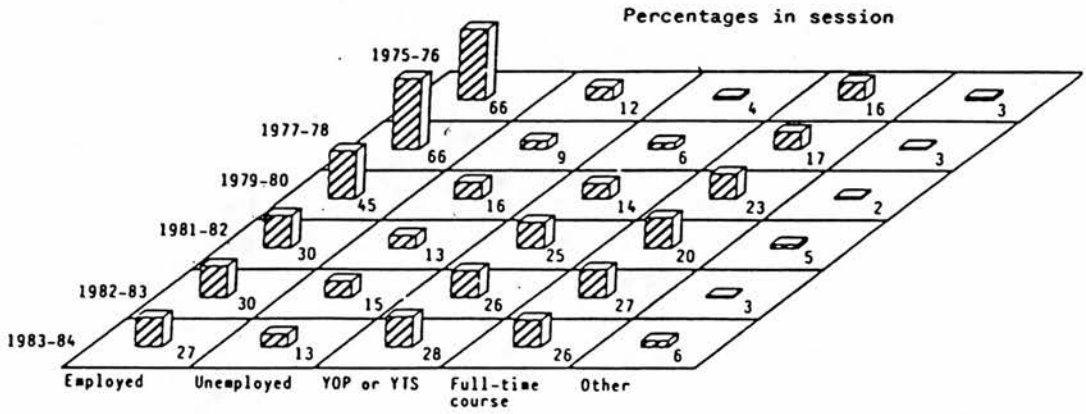
An overview of the issues

Educational policy and concerns are no exception to the rule that social and political life tends to exhibit a cyclical pattern. James and Tyack (1983) have shown how the dominant educational policy issues of the day are often associated with economic and social cycles. Periods of economic expansion are often associated with eras of progressive social and educational policy while those of economic contraction tend to be associated with eras of conservative policy.

Economic cycles are also linked at a higher level to other features of societies such as demographic change, technical progress, and war. With the exception of demographics, these more global concerns will not be addressed in the present work. The demographics of change in the school age population are important because they have a direct bearing on educational policy, in addition to any indirect bearing which they have through their influence on the economic system. The discussion and analysis below focus on the period from the mid-60s through to the mid-90s, which not only encompasses the period of the most significant post-primary reforms of recent times, but also bridges the secondary school-age population from the post-war baby boom peak through to the ensuing peak of the following generation.

Many of the issues which are chronicled in the history of educational thought are generic to the educational process and are constantly of concern to educational policy, eg. instructional pedagogy, the training and supply of teachers, but other issues seem to be located in specific eras. History, however, does not provide us with examples which directly parallel the concerns for educational effectiveness which have swept through the education systems of many of the industrialised nations over the past two decades.

Figure 2.1 Destinations of school leavers 1975-1985



Source: Scottish Educational Data Archive

The 1960s and 1970s ushered in a period in which comprehensive secondary schooling for the majority of the age cohort became a reality. With this went major reforms in certification. In Scotland the Ordinary grade, introduced in 1962, was intended for only the top third of the cohort but by the end of the 70s some three quarters of the cohort were presenting for at least one Ordinary grade examination. The 1960s and early 1970s were years of rapid economic expansion which coincided with expansion in the education system to accommodate both the progression of the post-war baby boom as it moved through the system and the longer tenure of pupils in the system. By the late 70s economic expansion had turned to contraction, and the secondary school population peaked in the early 80s. These conditions presaged the present educational and youth employment condition where in 1985 only 27 percent of school leavers were in full-time employment nine months after leaving school (figure 2.1).

While the 60s and 70s were infused with progressive theories for effective schooling centred on equality of educational opportunity, the 80s have seen educational policy and research for effective schooling driven by economic and demographic concerns. A notion of the single best curriculum and managerial style has emerged (Cuban, 1983) along with a paradigm of school effectiveness research which asserts that money does not make a difference. People do. Thus, spending more is of less importance strategically than redirecting funds to promote effective performance. The recipe for more effective schooling promoted by the instructionally effective schooling (IES) and school improvement(SIP) literature includes more direct instruction, better management and leadership, plus a common curriculum for all, with more emphasis on basics and academics. In addition, the situation of falling school rolls has served to highlight the role of management in the efficient reallocation of resources in a period of economic stringency.

During the 60s and 70s the social class distribution of outcomes was a major focus of research on schooling, but in the

early years of the present decade social class merely became one more attribute of the inputs to schooling to be statistically controlled before assessing the efficiency of the school as a production unit. Along with the re-emphasis of schools as production units went a new research orientation to them not as the production units of the economist but as the productive organisations of the organisational theorist.[1] The American literature is currently riddled with allusions to schools as businesses and it is commonplace to find their organisational features compared to those found in America's best run companies (Peters and Waterman, 1982; Clark, Lotto and Astuto,1984).

The IES literature starts out from the belief that there are schools which are more effective than others and locates these as outliers in studies of school systems. The approach derives from the work of Weber (1971) and Edmonds (1979a,b,c, 1981, 1982) who believed that there were some particularly effective schools serving inner city minority populations. Their research, and most of that which has followed, focused on pupils' attainment in basic skills. The IES literature suggests that a cluster of factors are associated with effective schools: (1) they have strong administrative leadership, (2) they project a climate of high expectations for pupil achievement, (3) they exhibit an orderly, but not oppressive, school climate, (4) they focus on pupils' acquisition of basic skills, (5) they employ systems for the continuous monitoring of pupil progress, and (6) they focus resources on clearly defined school learning objectives (Clark, Lotto and Astuto, 1984; Purkey and Smith, 1983; Ralph and Fennessey, 1983; Rowan, Bossert and Dwyer, 1983).

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[1] This change in emphasis towards organisational, as opposed to economic, models of efficiency had wider currency, a fact reflected in Herbert Simon's recognition for research on the organisational aspects of business corporations through his award of the Nobel Prize in economics in 1978.

A second literature on school improvement (SIP) research has run parallel to the IES literature. This has focused on the implementation aspect of research based school improvement programmes (SIPs), with only a secondary focus on pupil outcomes. This literature delves into organisational theory to identify issues which are likely to surface when externally produced innovations are introduced into an organisation. It identifies factors such as the way in which internal dynamics reshape externally introduced goals, resistance to change, and organisational norms and sanctions (Miller, 1980; Morrish, 1976; Sarason, 1971; Rogers and Shoemaker, 1971; Pincus, 1974), as features of the operation of organisations that impede the introduction of change and effectiveness of innovations.

A third literature from research conducted during the 60s and 70s on school effects also exists, although there has been little contact between it and the two previous literatures. The essential element of the school effects literature is its focus on policy manipulable inputs to schooling. Initially, this was construed to be direct economic and resource inputs in the form of per capita expenditure and teacher qualifications, etc. However, these measures of inputs were found to have little association with pupil achievement once pupil characteristics at entry to schooling were taken into account. Thus, this input-output model of schooling was later expanded to accommodate inputs relating more directly to instructional activities.

A recent development has been the introduction of a model of schooling which views schools as multi-level organisations (Barr and Dreeben, 1983; Hallinan and Sorensen, 1983). This model can be viewed as containing elements of both the input-output and organisational models of schooling. Essentially, the production of schooling outputs are viewed as outcomes within a hierarchical organisation. The organisational structure links the production at one level with that at the next level, while the production within each level conforms approximately to an input-output model. The different levels in the hierarchy of schooling are represented by

educational authorities, schools, curriculum departments, within-class instructional groups, and pupils. An important aspect of the model is the way in which each level is nested within the one above it, and the way in which the output at one level becomes an input at the level below. The implications of each of these literatures for practice and for effectiveness are dependent on the underlying models of schools from which they are drawn. The multi-level organisational model, however, suggests a way in which some of the findings from the various approaches may be reconciled.

As suggested earlier the educational concerns of the late 80s and 90s may not be those which permeated school effectiveness research during its incubation over the past two decades or so. That period was characterised by economic expansion and progressive educational reforms, but we are presently in a period of fiscal stringency and educational reforms deriving from different concerns. The current reforms are nevertheless likely to prove as momentous as those of the past two decades. They are reshaping the curriculum, assessment, and institutional structure in what amounts to a major expansion of post-primary education. The rapidly rising youth unemployment level of the 80s has forced Britain into the sort of educational expansion which took place in other nations during the more prosperous years of the last two decades. These reforms amount to an extension of the education system to nearly all young persons up to the age of eighteen years. The Action Plan, the Technical and Vocational Education Initiative (TVEI), the Youth Training Scheme (YTS) and Standard grade together are introducing wide ranging changes in vocational education and certification and will result in a restructuring of the relationship between secondary schools and colleges.

Knowledge drawn from research studies of effective schooling in the past two decades thus face two hurdles. The first is it's relevance to the institutions that will emerge from the present reforms. The second question is whether it addresses the issues and concerns of the day.

The changing context of post-primary education

The term post-primary is employed here to draw attention to the fact that recent changes have not only affected post-compulsory schooling but, TVEI, in particular, is affecting the structure of schooling in S3/S4 also. In this section recent reforms in post-primary schooling are discussed in the context of the broader changes in the demand for and provision of secondary schooling over the last decade. First, the effects of the declining age cohort and the rise in the participation rate on school rolls and teacher numbers are discussed. This is followed by an analysis of the changing profile of certification since the Ordinary grade was introduced in 1962, and, finally, the relevance of current policy-led and demographic changes are discussed in the light of the implications that they may have for effective schooling in the coming decade.

Pupil and teacher numbers

Table 2.1 indicates that the voluntary participation rate[2] in secondary education increased from 20 percent to 24 percent of the 16-18 age group between the 1979/80 session and the 1983/84 session. During this period the actual numbers of this age group in schooling increased from 55,100 to 64,300 before dropping back to 62,800 in 1983/84. The figures for the 16-18 age group, however, fail to reveal the full extent of the underlying trend in total enrolments in secondary schooling.

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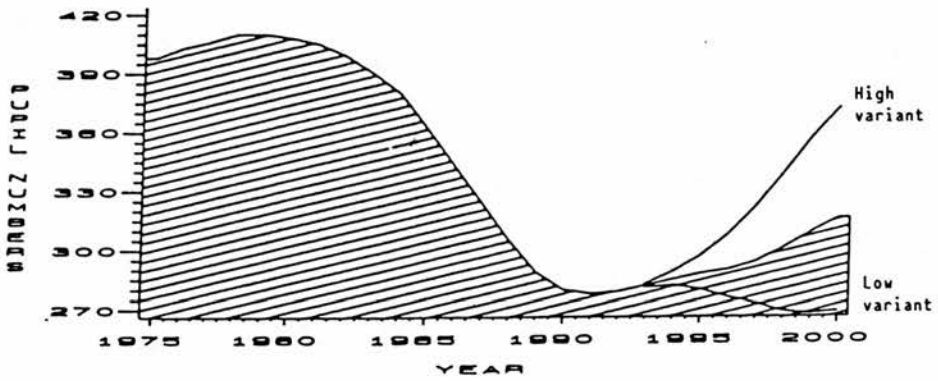
[2] The denominator for calculating the voluntary participation rate is defined by the proportion of the age cohort who could legally have left school at the commencement of the school year, which excludes from calculations all pupils who are not eligible to leave until after xmas.

Table 2.1 Young people aged 16-18† in education in Scotland 1977/78 - 1984/85

Mode of attendance and type of education	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Numbers of pupils							
Full-time Total	††79.2	79.2	81.3	88.3	94.8	100.0	96.0
School 53.0	53.0	53.0	55.1	58.5	63.8	64.3	62.8
Non-advanced FE	11.7	11.7	11.8	13.6	14.4	18.8	16.2
Higher education	14.4	14.6	14.4	16.2	16.7	16.9	16.9
Part-time Total	52.5	56.8	55.7	53.7	51.3	47.5	53.7
Advanced FE	1.3	1.7	1.7	3.1	3.2	3.3	3.4
Day non-advanced FE	39.1	41.6	40.7	37.7	37.5	33.3	39.9
Evening non-adv FE	12.1	13.5	13.3	12.9	10.7	10.8	10.3
Full-time + Part-time Total	131.7	136.0	137.0	142.0	146.0	147.5	149.6
Home population	264.7	269.2	271.0	274.6	277.0	272.8	264.7
Percentages of the age-group							
Full-time Total	30	29	30	32	34	37	36
School 20	20	20	20	21	23	24	24
Non-advanced FE	4	4	4	5	5	7	6
Higher Education	5	5	5	6	6	6	6
Part-time Total	20	21	21	20	19	17	20
Advanced FE	0	1	1	1	1	1	1
Day non-advanced FE	15	15	15	14	14	12	15
Evening non-adv FE	5	5	5	5	4	4	4
Full-time + Part-time Total	50	51	51	52	53	54	57

† At 31st december. †† Units are thousands. Source: SED, Statistics Branch, 1985.

Figure 2.2 Actual and projected numbers of pupils in Scottish secondary schools 1975-2000



Pupil numbers in thousands.
Source: Scottish Education Department Statistical Bulletin No2/B2/1984.

Figure 2.2 shows that secondary school enrolments have declined from a peak of 410,000 in 1979 to 362,000 in 1985 and are projected to decline further to about 280,000 in the early 90s before increasing to possibly 360,000 (under the high variant) by the end of the decade. This means that the decline between 1979 and 1985 was about 12 percent of the former total, with a further decline of 23 percent on 1985 enrolment levels expected by 1992. Thus, the effects of the contracting pupil population will become much more severe over the next five years. Although there may be some further increase in the voluntary participation rate arising out of current initiatives (TVEI, Action Plan), the 16-18 age group voluntary participation rate would have to more than double in order to fully offset this projected decline in enrollments.

Table 2.1 shows an expansion overall in the non-advanced further education sector between 1977/78 and 1983/84 of about 4000 places, however, this masks the change which has taken place in the distribution of places between full-time and part-time students, and that which has taken place more recently. As noted above, there was a relatively sudden rise in the secondary voluntary participation rate during the period 1981-1984, which reduced the pool of leavers who might have entered non-advanced further education. Nevertheless, there has been an increase of 6,600 in the number of students in part-time non-advanced further education, associated mainly with the introduction of YTS, during this period. The introduction of the two-year YTS has further increased the numbers in part-time non-advanced further education, and the Action Plan has increased the numbers in both full-time and part-time non-advanced further education. Although schools as part of the consortia involved in the delivery of modules for the Action Plan benefit from this activity, they are not involved in provision for YTS, thus it is difficult to see their decline in enrolments slowed much over the next seven years from expansion induced by YTS or the Action Plan.

Table 2.2 Educational Authority secondary schools 1975-85: Summary statistics on enrollments, staffing, and expenditure.

	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85
Average school size	910	920	950	930	920	920	920	900	880	850
Pupil teacher ratio	15.1	14.7	14.7	14.6	14.4	14.4	14.4	14.3	14.3	13.7
% Above recommended staffing level†	1.6	4.5	4.3	5.4	6.4	6.2	6.0	6.4	8.0	9.8
Number of pupils ('000s)	398	403	406	410	410	408	405	399	390	380
Number of teachers ('000s)	26.4	27.4	27.6	28.2	28.5	28.4	28.1	27.9	27.9	27.5
Total expenditure†† (£ millions)	483.90	529.19	489.75	527.01	524.18	534.18	551.52	552.83	558.15	554.60
Average expenditure per pupil (£)	1215	1313	1206	1285	1279	1309	1362	1386	1431	1460

† Calculations based on Red Book recommended complements in order to provide the same base for all years. Later additional recommendations (Circular 991, the Urban Program, and TVEI supplements) are not taken into account. Thus, for example, some of the 9.8% margin in 1984-85 is due to the complement of teachers employed under these programmes.
†† In 1984-85 prices (based on GDP deflator).
Source: SED Statistical Bulletins No. 1/B1/1977-78, No. 3/A3/1982., plus unpublished information supplied by the SED.

Table 2.2 indicates that even with closures there has been a continuous decline in the average rolls of secondary schools over the period 1975 to 1985, although there is significant variation between authorities. As the post-primary population declines decisions regarding closures will be governed primarily by the population distribution within authorities (MacFadyen and McMillan, 1984). Research on closures due to falling rolls suggests that the concomitant staffing and the curriculum problems experienced in England and Wales (Blackstone, 1981; Briault and Smith, 1980; Brown and Ferguson, 1978; Newsam, 1978) may be somewhat less severe in Scotland because of the more generous staffing levels allowed for smaller schools under the Red Book provisions (EIS, 1981; MacFadyen and McMillan, 1984; Lothian Region Education Department, 1982; Strathclyde Department of Education, 1981).

Resources and expenditure

Pupil teacher ratios (PTRs) declined from 14.4:1 in 1980 to 13.7:1 in 1984, and staffing levels increased from 2.1 percent to 9.2 percent above recommended staffing levels over the same period, and the average expenditure per pupil increased from £1279 to £1460, in 1984/85 prices, over the same period (table 2.2). At the start of the 1970s PTRs in secondary schools were about 16:1. The number of secondary teachers rose from 19,800 in 1970/71 to a peak of 28,500 in 1979/80 and declined to 27,500 by 1984/85. If the 1984 complement of staff were retained throughout the period until the trough in pupil enrolments in 1992 PTRs would fall to 10.2:1. Clearly this would constitute a very rapid decline, if it were to take place, in a mere seven years. A more realistic estimate of teacher numbers may be obtained by extrapolating forward on the basis of the decline in PTRs observed over the past fifteen years. The estimate from projecting forward on the simple basis of the average annual rate of decline between 1970/71 and 1984/85 is a PTR of 12.7:1 in 1992. This figure is somewhat higher than an estimate of 12.0:1 that has been calculated

elsewhere on the basis of the Red Book standards plus three percent, assuming an average school roll of 720 in 1992 (Lothian Region Education Department, 1982). A secondary teaching force of 22,000 would be required on the basis of the higher figure and 23,000 on the basis of the lower figure. Thus, a reduction in the secondary school teaching force of the order of 5,000-6,000, representing 20 percent on 1984/85 levels, is likely to take place over the seven year year period from 1985-92. Any new innovations in pedagogical methods which could make a substantial impact in the next few years are already known to educationists and the training of significant numbers of teachers in their use would take a minimum of 3-5 years, thus, even this projection could prove too be on the high side if the rate of introduction of new innovations is lower than in the previous decade and a half. This projected rate of change is much greater than the decline of only 1,000 in teacher numbers, 3.5 percent, over the five year period 1980-85.

Government expenditure projections at the national (UK) level for primary and secondary schooling together suggest, at current levels of provision per pupil, a reduction in annual expenditure of some £600 million between the level of 1984 and the trough in pupil numbers in 1991/92. It is, however, unlikely that expenditure on primary and secondary schooling will decline by this amount because of diseconomies of scale as schools become smaller, the need for increased inservice training, etc. The annual level of expenditure on schools in England and Wales has risen by over 10 percent in the last five years, in real terms, while pupil numbers have fallen by 12 percent (Source: DES, 1985a).

Table 2.3 Certification levels of school leavers 1964-1984

Session	Highest SCE qualification held								
	No SCE quals	O-Grades D or E only	O Grades A-C passes 1 - 2	3 - 4	5 +	Highers passes 1 - 2	3 - 4	5 +	Total
1964-65	70.2	†	3.5	4.3	4.1	6.2	7.2	4.4	99.9
1965-66	68.6	†	4.1	4.4	4.2	6.4	7.4	4.8	99.9
1966-67	67.3	†	4.1	4.8	4.1	6.2	7.8	5.6	99.9
1967-68	65.2	†	4.8	5.1	3.9	6.9	8.1	6.0	100.0
1968-69	62.5	†	5.1	5.3	4.5	7.3	8.7	6.6	100.0
1969-70	59.1	†	5.7	5.7	4.5	8.0	9.1	7.9	100.0
1970-71	56.7	†	6.2	5.8	4.8	8.3	9.7	8.5	100.0
1971-72	54.9	†	6.4	6.2	5.4	8.5	9.9	8.7	100.0
1972-73	-	-	-	-	-	-	-	-	-
1973-74	34.3	8.3	13.8	8.4	6.6	9.3	10.1	9.2	100.0
1974-75	34.8	8.6	14.8	8.8	6.4	8.9	9.4	8.3	100.0
1975-76	34.8	8.7	15.5	9.1	6.5	8.8	8.6	8.0	100.0
1976-77	33.1	8.1	15.1	9.5	7.4	9.2	9.1	8.6	100.0
1977-78	32.7	8.8	14.9	9.3	8.1	8.8	9.0	8.2	99.8
1978-79	32.5	9.5	15.2	9.2	7.9	8.5	9.0	8.2	100.0
1979-80	31.4	9.4	15.3	9.1	7.6	9.1	9.3	8.9	100.1
1980-81	30.1	9.1	15.4	8.9	7.3	9.6	10.1	9.5	100.0
1981-82	28.0	8.6	15.3	9.1	7.3	11.0	10.4	10.3	100.0
1982-83	26.2	8.7	15.7	9.2	7.7	11.8	10.4	10.4	100.0
1983-84	26.1	8.7	15.7	9.2	7.5	11.5	10.6	10.7	100.0

† These grades were not awarded before ROSLA in 1973.
Source: SED, Statistics Branch, 1986.

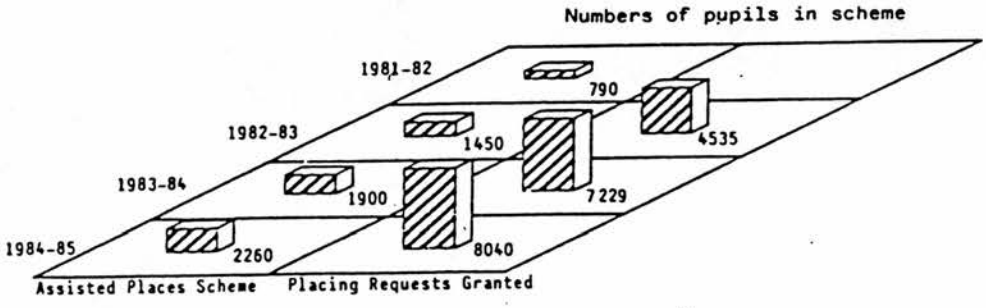
Certification and the growth in pupil attainment

The growth in certification since the Ordinary grade was introduced in 1962 is well documented (cf. Gray, McPherson and Raffe, 1983). Although when introduced, the Ordinary grade was intended to be awarded on a pass (grade A-C) or fail basis, this was changed to a five category A-E grading system in conjunction with the raising of the (minimum) school leaving age (ROSLA) to sixteen years in 1972/73. Also, the Ordinary grade was intended for the most able thirty percent of pupils, who were expected to seek certification in a minimum of three subjects, but the situation after more than two decades is one is which some 65 percent of school leavers obtain a pass (A-C grades) in one or more subjects. Table 2.3, however, shows that the level of certification among school leavers remained relatively stable between ROSLA and the end of the decade, with an increase of only two percentage points in school leavers gaining certification. Although there has been no perceptible change in the proportion of leavers holding Ordinary grades only since then, there has been an increase in the proportion of leavers holding Highers certificates. The recent rise in certification levels coincides with the increased secondary voluntary participation rate since 1981 noted earlier.

Reforms to the curriculum

Although it is too early to evaluate the likely influence of recent curriculum reforms and provision for post-compulsory education, there is the possibility that non-academically orientated Ordinary grade and Standard grade pupils will seek to continue their education in the freer and more autonomous environment offered by colleges of further education, rather than stay on at school. McPherson (1984) reported that among fourth year leavers with one or more Ordinary grades, 58 percent of males and 70 percent of females indicated that one of their reasons for leaving school was that they felt they would prefer life at work or college to life at school.

Figure 2.3 Secondary school pupil numbers: assisted places scheme, and placing requests granted



Source: Scottish Education Department
Statistical Bulletins No7/C5/1985, No9/B6/1983, No2/B6/1985.

Although most of these leavers also indicated that they wanted to start a particular job, there is evidence here that recent developments in post-compulsory provision could reduce the voluntary participation rate for schooling, thus exacerbating further the decline in enrolments. This information, however, has to be tempered by the fact that fifth year leavers indicated that the major reasons for their voluntary return to the fifth year had been academically based (90% of them indicated that they 'wanted to do Highers').

Other policy initiatives

Two other policy initiatives which may influence the distribution of pupils between institutions were also launched earlier this decade. the Assisted Places Scheme and the Parents' Charter. These policies have a potential to influence the distribution of pupils between the public and private sectors and between schools within the public sector, respectively. Figure 2.3 shows that the numbers of pupils concerned at the secondary level under each scheme is currently small, although there may be significant effects on enrolments for particular schools.[3] In particular, these policies may come to interact more often in the future with policies and actions related to school closures, an area of policy that is expected to become more prominent as the end of the decade approaches.

What makes schools effective

Although the publicly expressed concerns for schooling may change in line with prevailing social and economic conditions, many of the questions about the effectiveness of schooling are nevertheless of a generic nature . The discussion above has

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[3] Because of the high demand for places, four schools in Edinburgh were *roll capped* in 1986.

delineated some of the external factors which will be of concern with respect to the effectiveness of schooling over the next decade or so. They will be of particular importance because of the way in which they are expected to interact with some of the more generic issues to be discussed below. For example, school management practices and policies arising out of responses to falling rolls and their implications for teachers' career structures are important because of the effects they will have on instructional pedagogies, school process and climate, curriculum development, and assessment methods, etc. As outlined earlier, the literature on the effectiveness of schooling derives from three different research traditions: the school and classroom effects literature (SE), the instructionally effective schools literature (IES) and the literature on school improvement programmes (SIP) (Cuttance, 1985a).

The IES literature suggests that: teachers affect learning by the expectations they hold for pupil performance; pupils affect each other by their level of achievement, behaviour, and expectations; school management makes a difference by the climate it sets and the support it provides for teachers; and system level managers affect school leadership and management through the support and material resources they provide. The emphasis in this literature is on the way in which people matter, rather than the functions which they fulfil. This emphasis has been criticised because it leads to a prescription for effective schooling based more on the personal qualities of leadership and effective behaviour than on the actual organisational and pedagogic processes which are the basis of effective schooling. That is, it tends toward a definition of schooling in purely phenomenological terms through the location of constructs such as school 'ethos' (Rutter *et al,*1979) or good leadership as a 'syndrome' (Purkey and Smith, 1983; p8). As an antidote to behavioural checklists of superficial behaviours which fail to recognise the underlying complexity of schools this approach is welcome, but it does not of itself provide a satisfactory basis for a theory of effective schooling.

The IES and SIP literatures have focused mainly on elementary schools in inner city areas, schools with large proportions of low socio-economic status pupils, and outcomes related to the acquisition of basic skills. The SE literature, on the other hand, has focused on outcomes at the secondary school level across a wide range of schools. Together, the various literatures suggest several areas of promise. A synthesis of the findings and models from these alternative research perspectives is now presented. It begins with a contrast of the early and recent approaches to the question of the way in which resources influence effectiveness. Following this the influence of school process and climate are assessed, before turning to the pedagogic effects of instructional strategies and curriculum organisation on effectiveness.

The role of resources and management

Early work in the SE literature viewed schools as replicated production units and ignored their multi-level character. Hence, it is not surprising that they found various direct and proxy measures of expenditure did not appear to be associated with variation in aggregate levels of pupil achievement. The focusing of the analysis at the (aggregate) school-level meant that all variation in the distribution of resources within schools and between higher level organisational groupings (local authorities, school districts) was ignored. Studies employing an aggregate-level production function model assume that any input usage variation from the underlying optimal mix of input factors is surplus, hence evidence of the inefficient use of resources. Measures of resource input that have been investigated in many American studies but which have not shown a consistent relationship to pupil achievement include: expenditure (on buildings, average total expenditure per pupil, teacher salaries), physical resources (science laboratories, quality of buildings), instructional resources (books, pupil teacher ratios), and scale factors (size of school) (Hanushek, 1971, 1981; Murnane, 1981). Some aggregate (school-level) measures of teacher characteristics have, however, been found to be associated with

pupil achievement. These relate mainly to experience, voluntary attendance at inservice or college courses requiring a substantial commitment, teacher expectations for pupil performance, quality of college attended, and teachers' verbal ability (Hanushek, 1971, 1981; Murnane, 1981). In general, these characteristics of teachers are not directly rewarded in salary differentials, therefore they are not directly reflected in the expenditure measures mentioned above.[4]

There is relatively little research on resource allocation within schools. The case for research which links resource inputs directly to pupil performance is evident from the inadequacy of the usual production function and input-output models employed in many studies of school effectiveness. The one area in which such models have been extended to link pupil resource inputs to pupil-level achievements is in the allocation and use of instructional time (Levin, 1984). Earlier studies had worked at the classroom level and used measures such as class size and pupil/teacher ratios, but these were found to have only weak relationships with pupil-level achievement (Alexander and Griffin, 1976; Bidwell and Kasarda, 1975; Cooley and Leinhardt, 1980; Bridge *et al,*1979; Cuttance, 1980b; Summers and Wolfe, 1979). It was suggested that the reason for the failure to find a significant relationship at the classroom level was due to variation within classes in the allocation and utilisation of resources. This within-classroom variation was hypothesised to be due either to the fact that teachers did not know of instructional methods which would efficiently utilise the increased time available in smaller classes (Cuttance, 1980c) or because teachers were indeed making use of appropriate instructional strategies but allocating them in different ways across classrooms.[5] Thus, the issue was not so

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[4] Teacher salaries account for about 65% of direct expenditure on secondary schools, and since average salaries do not vary with effectiveness it is not surprising that neither do overall expenditure measures

[5] As for example, as suggested by Carroll's model of school learning (Carroll, 1963; Cahan *et al.* , 1983).

much one of how much time was available, but one of how the time was used[6](Stallings, 1980).

Research on the impact of time allocation at the pupil-level often derives from Carroll's (1963) model of pupil learning. However, the aspect of time investigated varies widely from study to study: engaged time (Karweit and Slavin, 1981), academic learning time (Borg, 1980), being two of the most researched constructs. Although the focus on time ties in closely with mastery learning techniques discussed below, time does not appear to have an unambiguous relationship to pupil achievement. In particular, pupil heterogeneity and the organisational characteristics of classrooms and schools have been found to significantly influence the allocation of instructional time in schools (Karweit, 1985; Barr and Dreeben, 1983).

These findings on the relationship of resources to pupil outcomes are all drawn from the school and classroom effects literature. In marked contrast the IES literature rarely considers the level of and variation in resources between schools. It has focused instead on the management of resources (Cuban, 1983). This research, rather than assume that the pattern of use of resources is constant across schools, explicitly sets up a pivotal role for the active management of resources. This includes the management of basic resources of teaching inputs and materials, but the management task is more broadly conceived than just the role of allocating resources. Since alteration to the allocation of resources in a school will elicit behavioural responses from teachers and pupils, and possibly others external to the school, it

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6 Although Wiley & Harnischfeger (1974) found quantity of schooling to be a statistically significant source of variation on pupil achievement in a sample of urban schools, Karweit (1976) found no effect in the full sample of schools in the data employed in the former study. Schmidt (1983) also reported a relationship between quantity of schooling and pupil attainment. On the basis of these findings and other work that has indicated a significantly shorter school year in the United States compared to that in many other countries (cf. Garden 1987), several states in the US have moved to lengthen the school year. The evidence for a relationship between quantity of schooling an pupil attainment is reviewed by Karweit (1985).

is viewed in the context of the management of innovation and change.

The structure of school management in Scotland was set out in Circular 826 (SED, 1972) which promulgated the Department's policy on promoted posts in schools. Forty-seven percent of all teaching posts in secondary schools carry some designation of special responsibility. Of these posts the majority (66 percent) are held by teaching staff with special responsibilities related to curriculum subjects, 19 percent are principal teachers or assistant principal teachers, and 15 percent are senior promoted posts (assistant head teacher or above) (SED, 1984). This means that almost half of all teachers have some management and administration functions in addition to those directly related to their own teaching. Most of the research on the role of management in school improvement programmes and instructionally effective schools has, however, focused on the role of the head teacher.

There has been considerable debate as to whether the functional role of the principal or whether aspects of leadership are the most important for effective schools (Clark, Lotto and Astuto, 1984; Gersten, Carnine and Green, 1982). The crux of the debate resolves around whether or not it is important that the principal performs certain functions or whether they can be carried out by other staff. Functions are easier to define than the elusive phenomenology of leadership. Furthermore, none of the models of leadership available explain the variation in performance, and teachers do not usually perceive principals to be instructional leaders, nor do they usually function as such (Mazzarella, 1977; Morris *et al,*1981; Howell, 1981; Lortie, 1975, Wolcott, 1973).

Although some studies of leadership have suggested that an interactive leadership style, as opposed to a directive and authoritarian or a laissez-faire style may be more effective, there does not appear to be any particular cluster of leadership attributes or behaviours which could be used prescriptively to develop effective leadership (Cuban, 1983 Mackenzie, 1983b). This

situation has led some researchers to dismiss the concept of educational leadership, because it does not appear to be amenable to manipulation by educational policies given current knowledge (D'Amico, 1982; Ralph and Fennessey, 1983).

A focus on the functional role of management is probably more suited to the understanding of differences in performance between schools in the Scottish system during the approaching period of change. This is not to suggest that there is no role for leadership, but that it is part of the process of management, rather than a substitute for management. Further, as rolls continue to fall over the next few years, functional flexibility will become a more important feature of promoted posts (SED, 1984).

School managements are required to respond to external responsibilities as well as those relating to the internal operation of schools. Their external responsibilities relate primarily to the task of furnishing their educational authorities and the Scottish Education Department with information on their operation, and to the mediation of demands made on the school by various bodies and groups. The accountability of schools to educational authorities and the Scottish Education Department for the implementation of policy ranges from health and safety matters to accounting for the performance of pupils in public examinations and the utilisation of resources. The recent HMI report on school management (SED, 1984) indicates that demands for more thoroughgoing accountability procedures are growing. The issue of the accountability of teachers to the educational authority has not been part of accountability procedures in the recent past, and in England and Wales the Department of Education and Science appears to have decided that it should not become part of formal accountability procedures. The Department of Education and Science has encouraged the rise of school based review procedures, initiated and conducted largely by school staff, as a means of continuous internal evaluation of school practices and policies (DES, 1985a). In a review of pilot programmes in 50 schools the two most commonly mentioned objectives held by schools in

conducting such reviews were those of staff development, and the review of performance at either the teacher-, department-, or school-level (Turner and Clift, 1985). The fact that these reviews were almost entirely school controlled and initiated, with outside assistance where necessary, meant that the often cited tension between professional development and accountability was much weaker (Nuttall, 1981). However, it is not completely dissolved because the individual teacher is still accountable to a professional code of practice and to the curriculum department and fellow teachers within the school. As a means of discharging their responsibility to be accountable to their 'clients', schools may employ teacher assessment and school based review procedures to keep the quality of schooling under review and to ensure that changes are made when needed. There is a substantial literature on school based review procedures.[7] Some of the relevant issues in their use as review procedures include: confidentiality, honesty in self-appraisal, whether schools with poor performances are willing to subject themselves to close self-scrutiny (often the school climate and collegial relationships may be less than propitious), and the role of external assistance, among others. As in other self-regulating professions, professional teacher organisations will need to provide a framework in which problems arising from these issues were dealt with. There do not seem to have been any formal initiatives to establish similar models of school based review procedures in Scottish secondary schools, although the recent inspectorate report on school management does suggest that there is a need for some form of such appraisal (SED, 1984).

Research on the role of management in a situation of falling rolls has suggested that it will not be falling rolls per se which pose the main problems of adaptation, but the interaction of falling rolls with changes in the curriculum and the organisation of

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7 Nuttall (1981), Turner & Clift (1986), and Hopkins (1985) review this literature.

schooling due to the introduction of Standard grade, the Action Plan, TVEI, and a two-year YTS. The literature on organisational change suggests that the following functions of management are of particular importance in this situation: the development of goals and objectives, monitoring of progress in achieving objectives, the efficient utilisation of resources, and the efficient administration of the organisation. These functions require that further secondary functions be developed, particularly those relating to the collection of information on the implementation of policy and its effects. Both American and Scottish research indicates that administration consumes an inordinate amount of management time and that management training and development frequently receive less than their share of time (Goodlad, 1983; SED, 1984). There would appear to be considerable scope for reducing the burden of administration and of integrating information collection procedures into the day to day running of schools by developing an appropriate computerised management information system for schools. School management information systems for such purposes have been a neglected area of both research and development.

The impending changes in the curriculum and those which will follow as a consequence of falling rolls will require management to be able to cope with a continually changing situation. In addition to constraints on the range of staff and the experience of staff available we are in the midst of substantial organisational and curriculum changes associated with initiatives such as TVEI, Action Plan, and the introduction of Standard grade. These changes and the continuing change induced by declining enrolments will call for greater flexibility in the specification of posts and roles, in curriculum organisation, and in instructional approaches to the curriculum, and will present schools with a set of constantly changing conditions requiring proactive and coordinated management. It will thus be important that those responsible for managing schools recognise the interdependence between pupil and teacher needs in the teaching-learning process through whole-school policies which provide opportunities for the professional

development of teachers, while at the same time catering to pupil needs.

Coupled with the declining opportunities for promotion and transfer, falling school rolls will produce a situation of little movement in the teaching forces within schools. Not only will this severely reduce the inflow of new ideas which new teachers bring with them, but it will also mean that management will have to work with skills and resources which have been bequeathed from an earlier era. Inservice training and professional development will thus assume a more important role in the range of management techniques to be employed. The recent HMI report on school management (SED, 1984) provides an impression of an overly administered but under-managed school system. Senior management spend an inordinate amount of time carrying out basic administrative duties and organising day-to-day activities, with little time for planning, coordinating management between those with special responsibilities, or catering for the professional development and training of their staff. The report found little evidence of adequate monitoring and management information systems which would assist the task of managing resources and aid coordination in decision making. It identified a need for the inservice training of senior management themselves in fundamental management techniques such as the delegation of responsibility, ensuring accountability, shared decision making, the deployment and supervision of staff performance, the professional development of staff, the integration of management responses to such issues as falling rolls and curriculum change, the use of working parties and committees, etc.

The SIP literature offers some guidelines on the management of change from the perspective of the related problem of the management of innovation. The factors which have been found to be associated with the success of enduring educational innovations are: (1) the quality of the assistance provided, both in the form of direct assistance and training, (2) teacher achievement in utilising the programme in acknowledged problem areas, (3) moral and

professional support and adequate funding support, and (4) flexibility in adapting the innovation to perceived needs (Berman and McLaughlin, 1975, 1978; Black *et al,*1984; Black, 1985; Fullan, 1982; Weatherley and Lipsky, 1977). These factors, which influence long term success, are backed up by other factors found to influence the initial adoption and acceptance of innovation. Programmes are more likely to be adopted the greater the perceived advantage, and the greater the compatibility of the innovation with current practices, however, in the latter case the effects are also more likely to be trivial. On the other hand, innovations which are ambitious in scope and those that are more complex are also more likely to be adopted than simple programmes (Berman and McLaughlin, 1975; Clark, Lotto and Astuto, 1984). Successful implementation requires good management in which the establishment of goals, clarity of communication, procedures for resolving conflict, a problem solving approach, and the ability to obtain the commitment of staff in a task oriented team approach, are important features (Lewis, 1985; Morrish, 1976; Miller, 1980; Sarason, 1971). The support of educational authority leaders is important in facilitating implementation provided it is sensitive to the history and context of the school (Purkey and Smith, 1983; Sarason, 1971).

Early research on the adoption of innovations in education emphasised the involvement of teachers in the adoption phase, but more recent research has suggested that senior management are pivotal to any decision to adopt (Clark, Lotto and Astuto, 1984). The importance of the various actors in the system depends on the tightness of coupling between levels and within levels of organisations (March and Olsen, 1976; Meyer and Rowan, 1983; Weick,1976). Mandated programmes have a much greater chance of full implementation in a tightly-coupled system and they are much less likely to achieve their intended objectives in loosely-coupled systems. The points made earlier on sensitivity to context and adaptability to perceived needs are particularly important in schools which are more loosely-coupled. In a study of innovation in Wales it was found that innovations introduced by staff below the

level of deputy head often diffused downward without requiring the active participation of the head, whereas those introduced at the level of deputy head always went up to the head before being diffused down through the structure to other teachers (Phillips, Davie and Callely, 1985). The diffusion networks in the two cases were quite distinct from each other. The study did not indicate the degree of organisational coupling in schools where the diffusion took different paths, although there was some evidence that innovations were more likely to succeed the higher up in the school they were introduced, which supports the view that tight-coupling facilitates the implementation of innovation.

Many studies of programme implementation have failed to differentiate between types of programme. There is a substantial difference in scale and character between the large scale programmes designed to tackle social disadvantage in the 70s (Berman and McLaughlin, 1975, 1978) and the small scale intensive programmes of school improvement which have predominated in the 80s (Miles *et al,*1983). The former are system and pupil orientated whilst the latter are oriented toward schools and teachers. This may account for some of the discrepancies in findings about the role of leadership, and it may also be one of the reasons why there has been uncertainty about the role of teachers at the adoption stage in many district wide school improvement programmes. Because they are typically under-resourced, a large proportion of school improvement programmes have relied on the self-selection of schools to the programme. Schools with high-profile school leadership and those with enthusiastic teachers are thus more likely to be represented in such programmes. This would explain why some studies suggest that teacher commitment to the programme in the initial stages is crucial while others suggest that it can be generated in the implementation process itself (Clark, Lotto and Astuto, 1984). Teacher resistance to innovation and change is likely to be more critical in cases where the programme is not mandated, such as in the introduction of new educational technology based teaching methods. It is at this point that the question of the degree of coupling in schools is most

critical. Some degree of loose-coupling facilitates the implementation of a programme by allowing it to be adapted to local contexts and needs, but it also allows for the subversion of the programmes objectives. Since studies of the implementation of school improvement programmes generally view the goal of the innovation as change at the school-level rather than at the pupil-level, they rarely focus on the subversion of objectives at the pupil-level.

The programme of preparation in schools for Standard grade has essentially employed a model of teacher-teacher collaboration, rather than external expert-teacher collaboration, in the design and preparation of new curricula. The success of this programme supports research findings that teachers learn best from other teachers and that external assistance is only of use if it is both practical and concrete (Gersten, Carnine, and Green, 1982; Clark, Lotto, and Astuto, 1984). One reason for the success of this model is that it recognises the basic position that teachers make decisions based on their own professional experience and that knowledge external to this is often discounted or rejected in the decision making process (Hammersley, 1980; Hargreaves, 1984a; Jackson, 1968; Lortie, 1975). This aspect of teachers' behaviour has also been employed to explain why they often seem to withdraw from management and administration within schools (Hargreaves, 1984b; Hanson, 1981; Burlingame, 1981; Gronn, 1983). Teachers' rejection of research and theory can be viewed as a means of privileging their knowledge of teaching and hence of neutralising external threats of criticism of existing routines and methods (Hargreaves, 1984a).

These arguments have important implications for the provision of inservice training and for the role of school self-evaluation procedures in programmes of professional development. They suggest that to be successful such activities must be cognisant of the fact that teachers are oriented to and make decisions on the basis of their professional experience. Hence, programmes which support a redefinition of the structures in which teaching,

management and administration take place are more likely to be successful (Hargreaves, 1984b). Changes that increase the time devoted to decision making, visits to other schools, and more general inservice work within the framework of the official timetable would give teachers a wider professional base of data, theory, and comparative experience. The formal incorporation of inservice training within the timetable may become more feasible as enrolments decline. Without the broader base of experience which such training can provide, programmes of school self-evaluation and innovation are likely to lead to a withdrawal of teachers from the management implications of these programmes. The involvement of teachers in more active team management, as opposed to carrying out special responsibilities in relative isolation from one another, would also provide opportunities for career and professional development (SED, 1984). Further, this would provide an occasion for schools to develop profiles of potential career development for each member of staff and to institute a systematic approach to the evaluation of the individual professional needs of teachers. Various programmes along these lines have been developed in schools in North America. However, the comment of one teacher that they felt they were being "checklisted to death" (Freer and Dawson, 1985; 722) under one such programme provides a salient warning against an over-enthusiastic development of the monitoring side of professional development and self-appraisal schemes.

The role of inservice training will become increasingly important with the need to respond flexibly to changing demographic, social, and pedagogical demands. Most of the teaching in the next decade will be undertaken by teachers now in the system and declining enrolments will mean that relatively few new teachers will be recruited. One of the problems in the design of inservice training is that teachers and management in schools often already know about more effective methods and techniques suggested by research or practice elsewhere but they fail to make use of them themselves (Cuban, 1983). Thus the impact of school organisation on teacher behaviour is an important consideration.

The argument that teachers learn better from other teachers and that experience and involvement in management and decision making in the school situation is important, suggests that inservice training may be more efficacious if it is largely school-based and school-centred.

School ethos and school climate

Recent research on the effectiveness of schooling has argued that school 'ethos' (Rutter *et al,*1979) or school 'culture' (Purkey and Smith, 1983) is an important aspect of effective schooling. However, while many researchers agree that differences in climate exist, they also agree that it is elusive, complex and difficult to describe and measure (Cusick, 1973; Goodlad, 1983; Rutter *et al,*1979; Tye, 1974; Weber, 1971).

Although attempts have been made to ground the concept of school climate in more general frameworks drawn from typologies of organisational environments (Anderson, 1982; Insel and Moos, 1974 Moos, 1974; Tagiuri, 1968), most researchers have continued to define climate along the lines of Lezotte *et al* (1980) "[climate is] . . . the norms, beliefs, and attitudes reflected in institutional patterns and behavioural practices that enhance or impede student learning" (p4). This type of definition makes space for a complementary definition of school process as the actual behavioural and organisational practices which take place in schools, hence it recognises an essential characteristic of climate as an epiphenomenon of school process. This, however, does not deny school climate its relevance in influencing the behaviour of teachers and pupils in schools, for they respond to situations partly on the basis of their perceptions of climate. Put this way, the question of whether climate is a cause or effect of pupil outcomes is resolved by suggesting it is both, but that it is not temporally both at the same time. Pupils and teachers through their behaviour are continually generating and regenerating the social conditions and hence the climate in schools.

While much of the research has focused on school-level climates there have been parallel developments in studying classroom climate (see Chavez 1984, for a review). Some research has found that climates vary across classrooms within schools, thus measures of school climate may not capture all the variation in climate across schools. Some of the within-school variation in climate also appears to be curriculum related. For example, in one study maths classes were found to be perceived by pupils as goal directed and difficult, while science classes were perceived as disorganised and formal (Welch, 1979).

Although rarely investigated, we would also expect to find that school climates are influenced by the communities in which they are located. The integrated relationships between schools and other social institutions, particularly in smaller communities, implies that the climate of schools is probably rooted in the historical conditions under which the relationship between community and school have developed. Coleman and Hoffer (1987) argue that a strong value consensus between the school and its client community is one of the principal reasons for the superior performance of the Catholic schools in the USA.

Research has established a clear link between the educational environment of the home, parental involvement in schooling, and pupil performance (Brookover *et al,*1979; Clark *et al,*1980; Edmonds, 1979a; Marjoribanks, 1974; Wiseman, 1967). However, the ways in which parental involvement in schooling has an influence is not clear. Brookover *et al* (1979) found that low achieving schools had as much involvement by parents as high achieving schools, but that a larger proportion of the involvement in the latter schools was initiated by the parents. There is a need to assess the relevance of particular forms of parental involvement, and its relationship to programmes within schools.

Several instruments have been developed for studying school and classroom environments,[8] however, none of these are in regular use in studies of school effectiveness. Most school effectiveness research considers only a small subset of the indicators of climate measured by these instruments, hence there are few studies which provide a broad analysis of the relationship of school climate to effectiveness. Although Brookover *et al* (1979) and Brookóver and Lezotte (1977) did find that climate and effectiveness were highly related, Goodlad (1983) argued that climate contributes mainly to the affective development of civility, aesthetic taste, and social outcomes for pupils. Rutter *et al* (1979) found that certain aspects of climate were related to pupil outcomes at the school level. There is a consensus in the school improvement literature that the following aspects of school environment are conducive to effectiveness: an orderly environment; effective low key discipline; clear and reasonable rules and procedures; consistency in supervision and enforcement of rules; cooperative involvement between staff and pupils; an emphasis on school as a problem-solving, learning environment; high expectations; and a consensus over academic goals.

As suggested earlier, climate and process are linked together through the reflexive actions of pupils and teachers. Climate influences process through its determination of situational conditions. Although not a feature of the IES and SIP literatures, peer groups have been viewed as loci of subgroup norms and values within schools in the SE literature. That is, differential perceptions of school climate have been associated with the peer group structure within schools. The streaming and curriculum options structure, in particular, within schools have been associated with peer group function (Ball, 1981; Lacey, 1970; Hargreaves, 1967), and with differential pupil perceptions of the outcomes of school processes. The degree of pupil's perceived futility is reduced by peer group norms which value academic

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8 Anderson (1983b), and Chavez (1984) review this literature.

outcomes (Brookover *et al,*1979; Hargreaves, 1967) and these norms have been found to be associated with pupil performance (Brookover *et al,*1979; Coleman *et al,*1966; McDill and Rigsby, 1973). Although peer group norms are thought to be associated with the intake composition of schools, there is disagreement as to whether the balance of intake influences outcomes independently of climate and process. Rutter *et al* (1979) found an identifiable independent effect for each, but Brookover *et al* (1979) found that intake balance had no independent effect once process and climate had been taken into account. The relationship between school composition and climate is, however, likely to represent processes of interaction between school and family, and between school and community, in addition to process located mainly within schools.

The research literature suggests that several aspects of school process influence outcomes. Because process has two opportunities to influence outcomes, both directly, and indirectly via climate, the findings with respect to the influence of climate on outcomes partially reflect the influence of process also.

Easily measurable objective measures of school climate and process, however, rarely display any significant degree of association with pupil outcomes. Teacher effort in preparing lessons, the checking of record books, and the condition of buildings were not found to be associated with effectiveness in the Rutter study, although decoration and care of classrooms was. Class size and school size as potential mediators of climate have not been consistently associated with effectiveness either (Weber, 1971; McDill and Rigsby, 1973; Rutter *et al,*1979; Weber, 1971). Goodlad (1983) has noted that schools show relatively little variation in terms of gross indicators of climate, for example, lunch and recreation areas are drab and utilitarian in terms of decoration and facilities in most schools. He contrasts this with the relaxing and brighter conditions found in offices and business environments.

School process factors associated with the professional management and organisation of schools are associated with

effectiveness. As characteristics of climate these factors are manifested in high teacher morale, clear goals and a high degree of involvement by teachers in school management. Teacher morale and commitment is associated with effectiveness (Brookover and Lezotte, 1979; Ellett *et al,*1977; Phi Delta Kappa , 1980; Maxwell, 1967; Miller, 1969) and commitment tends to be higher in decentralised management systems, provided there are effective communication channels far conveying decisions throughout the school (Azumi and Madhere, 1983; Hage, 1980; Kottkamp and Azumi, 1983; Little, 1982; Miskel *et al,*1983). Several studies offer support for the proposition that a high level of teacher involvement in decision making is related to effectiveness (Ellett and Walberg, 1979 Phi Delta Kappa , 1980; Rutter *et al,*1979; Wynne, 1980). This suggests that school management has a clear role in catalysing teacher involvement and in establishing the necessary managerial infrastructure for decision making to be effectively carried out. It also has the function of assisting the establishment of clear goals which provide a framework for coherence and robustness in the day-to-day operation of the school (Ellett *et al,*1977; Licata *et al,*1978; Wynne, 1980). Coherence requires that school management develop a consensus among staff with respect to issues of behaviour, discipline, curriculum, etc, if the school is to be effective (Ellett *et al,*1977; McDill and Rigsby, 1973; Rutter *et al,*1979; Wynne, 1980).

Consensus must also extend to include pupils if peer group norms are to encompass school norms (Rutter *et al,*1979). Opportunities for extra curricula activities and the level of shared pupil-teacher activity and decision making, and the degree of responsibility given to pupils all provide an effective forum for the negotiation of school norms (Cox, 1978; Duke and Perry, 1978; Epstein, 1981; Epstein and McPartland, 1976; McPartland *et al,*1971; Mitchell, 1967; Rutter *et al,*1979; Scheerer, 1981).

The development of school and peer group norms is a negotiated product of teacher-pupil interactions. One of the teacher contributions to this negotiation which has consistently been

associated with effectiveness is the type and level of expectations held for pupil performance. These expectations play a dual role. First, they directly influence the approach of teachers to the motivation and learning of pupils. Second, they influence the approach of pupils to learning by affecting pupils' perceptions of their self-concept. Both of these factors have been widely documented as mediators of pupil achievement in recent studies of school effectiveness (Brookover and Schneider, 1975; Brookover *et al,*1979; Brookover and Lezotte, 1979; New York State Department, 1976; Phi Delta Kappa , 1980; Rutter *et al,*1979; Schneider *et al,*1979; Weber, 1971). There is also considerable support for the influence of expectations from research on other aspects of schooling (Ball, 1981; Cuttance, 1979; Hargreaves, 1967 Keddie, 1971; Lacey, 1970; McDill, Rigsby and Meyers, 1969; Rist, 1970; Williams, 1976). Although there has been some controversy surrounding the role of expectations due to the failure to consistently replicate earlier 'pygmalion' studies (Rosenthal and Jacobson, 1968), it is now thought that the success of these experiments was highly dependent on the credibility of the information they employed to manipulate the expectations of the teachers participating in them. Allied to this is the proposition that naturally occurring expectancies have more powerful effects than those induced by experimental manipulation.[9]

Process factors which create climates conducive to effective learning include consistency in the application of rewards and punishments (Breckenridge, 1976; Brookover *et al,*1979; Phi Delta Kappa Study, 1980; Rutter *et al,*1979; Wynne, 1980), and an emphasis on academically oriented achievements (Brookover *et al,* 1979; Brookover and Lezotte, 1979; Edmonds, 1979a, b; McDill and Rigsby, 1973; Mitchell, 1967; Phi Delta Kappa , 1980). However, there is some evidence that highly competitive academic climates are not the most effective because they tend to be less stable and robust (Licata *et al,*1978). An emphasis on cooperation and team,

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[9] MacKenzie (1983b), and Persell (1977) discuss the evidence on these issues.

rather than individual, competition appears to be more conducive to achievement (Brookover *et al,* 1979; Wynne, 1980).

Although the guidance system in British schools is primarily oriented to the needs of pupils (Galloway, 1985; Hamblin, 1978) it provides an avenue for actively involving pupils in decisions about their own education and the promotion of the aims and objectives of the school. The skills and functions associated with the guidance system are also integral to the everyday process activity of the classroom (Galloway, 1982). Guidance policies have been shown to influence pupil attendance (Jones, 1980) which has been studied as an aspect of effectiveness (Reynolds, 1976a, b; Reynolds and Murgatroyd, 1977), but have been found elsewhere to be unrelated to school suspension rates (Galloway *et al,*1984). Galloway has described how the internal inconsistencies in guidance and pastoral systems can sometimes serve to subvert their potential to make a pósitive contribution to school climate and process. He found that in many schools: (1) class teachers changed each year, (2) they seldom taught their own tutor group, (3) they saw their tutor groups for only five to ten minutes each day, (4) year tutor's functions were defined in terms of investigating and dealing with problems, rather than as leaders of a pastoral team, (5) class tutors felt that year tutors were responsible for pastoral care and that the delineation of responsibilities was unclear (1985; p79).

Curriculum and instruction

School effectiveness research has only recently moved to take on board the influence of curriculum organisation and instructional methods on pupil outcomes. However, there is an extensive literature on these areas of schooling, which has been largely developed within teacher effectiveness, classroom process, and instructional methods research. Although a detailed review of these literatures is germane to knowledge on the effectiveness of schooling it is beyond the scope of the present enterprise. The discussion merely locates and briefly describes research findings

from the areas of this literature that are of most salience to studies of the effectiveness of schooling over the coming decade. Recent research has argued that the operation of the curriculum can be likened to a fractionation process in which different products are produced and fed into the process of schooling at each level. At the school-level the organisation of the curriculum influences policies on grouping within years (setting), and the allocation of teachers, pupils and resources to classes. At the class-level it interacts with pupil inputs through instructional technologies to determine the pace and coverage of pupil exposure of curriculum material. Many aspects of the organisational structure, processes, and practice of schooling are therefore linked directly to the curriculum.

Comparative research has shown that the degree of exposure to curriculum material is an important discriminator of differences in performance on standardised tests between nations (Anderson, 1986). Likewise, it is expected to be a significant influence on differences in pupil performance within a system, and hence to impact on the assessment of the performance of schools where such assessment relates to curriculum related outcomes. The degree of variation in curriculum content and coverage in Scottish schools is not well documented, hence it is difficult to know the extent to which performance differences between schools reflect curriculum variation. The variation in the informal curriculum is even less well documented than variation in the formal curriculum. The informal curriculum is expected to be linked to variation in effectiveness across schools because it is likely to be associated with between-school variation in the goals of schooling.

There will be a mixed curriculum and assessment menu for the third and fourth years on offer in schools for the remainder of the decade. The implementation of the Standard grade curriculum and assessment procedures were delayed by the recent disputes over teachers' pay and conditions. Schools will be faced with a mixture of Ordinary grade and Standard grade curricula across departments, which will make comparisons of performance across schools

considerably more difficult in the short term. In such a transition stage it is likely that there will be considerable variation between schools in pupil exposure to specific curriculum content.

Long before schooling became a universal phenomenon the curriculum was differentiated and pupils grouped in various ways.[10] Within the modern comprehensive school, curriculum differentiation takes place through pupils' selection of different subject combinations and, more directly, through setting policies and implicit instructional grouping (differential allocation of instructional resources) within classrooms. The interaction between curriculum differentiation and different approaches to instruction results in differences in pacing and coverage of the curriculum, which in turn influence pupil achievement (Barr and Dreeben, 1983; Eder, 1981; Hallinan and Sorensen, 1983; Rowan and Miracle, 1983). This suggests that variation in the effectiveness of instructional methods will be associated with curriculum differentiation. Curriculum differentiation is thought to influence achievement through its effects on peer context - the differential peers hypothesis - (Alexander and McDill, 1976; Alexander and Eckland, 1975; Alexander *et al*,1978; Rowan and Miracle, 1983) in addition to its effects on pacing and teacher-pupil interaction - the differential instruction hypothesis (Rowan and Miracle, 1983). The work of Hargreaves (1967) and of Rutter *et al* (1979) on English secondary schools and of Alexander and his colleagues (ibid) on US high schools supports the differential peer hypothesis. The differential instruction hypothesis is supported by Barr and Dreeben's (1983), and Rowan and Miracle's (1983) research. However, both of these latter studies were conducted on elementary schools and in the US, thus we do not know whether the hypothesis holds for Scottish secondary schools. We would need to have evidence on the relationship of setting practices, and teaching methods to pacing and curriculum coverage, and achievement before

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[10] See, for example, Law's (1965) discussion of 18th Century schooling in Edinburgh.

adjudicating on this. The rise of organisational aspects of the curriculum in the school effectiveness literature provides a new perspective from which to view research on instructional methods.

The last decade of research in instructional methods has seen three alternative approaches to instruction being promoted. The challenge to traditional instructional methods, recently given new life by reformers emphasising the importance of basic skills[11], and the SIP and IES literature under the rubric of 'direct instruction', was laid down by mastery learning (Bloom, 1976; Block and Burns, 1976) in the mid-70s. Early this decade we also saw the emergence of team and cooperative learning approaches (Slavin, 1980, 1983a). Between them these three approaches span the main types of curriculum differentiation expected to be found within classrooms in secondary schools. Direct instruction focuses on instruction to the whole class simultaneously, with pacing and coverage being determined by a steering group of pupils from whom the teacher takes cues as to the difficulty of material and an appropriate level to the pacing of instruction (Dahllof, 1971; Lundgren, 1972). There is evidence that the steering group may be located at about the twenty-fifth percentile level of pupil performance (Arlin, 1984) hence, it would not be too surprising to find this method of instruction to be particularly effective when the acquisition of basic skills is the criterion of effectiveness, as is indeed the case in much of the IES and SIP literature.

Mastery learning, on the other hand, is based on a substantial degree of individualisation in the instructional process. In its most extreme form it can be seen as the basis of a system of one-to-one tutoring, but in most system-wide implementations it is practiced as a class-based method of instruction augmented with a small group tutorial review procedure for pupils not acquiring mastery of the material in the initial class-based instruction period. For successful implementation it has to be augmented with

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11 For example, see the discussion in Boyer (1983), and US Government (1983).

a system of enriched or alternative activities for the fast learners to pursue while the slower members of the class receive additional 'corrective instruction' in tutorial groups. Strong claims have been made for the efficacy of mastery learning. Bloom (1984) estimated that the average pupil in mastery learning groups can achieve at the 84th percentile of the achievement distribution under conventional teaching, and Block and Burns (1976) concluded that the achievement levels of 75 percent of all pupils could be raised to the level now enjoyed by the top 25 percent of pupils.

Team and cooperative learning strategies are based on the proposition that a highly competitive environment is actually detrimental to pupil learning but that a degree of competition is nevertheless important. In this instructional method the teacher presents study material to heterogeneous learning teams of about four pupils, who are rewarded on the basis of the average performance of team members on individually administered assessments. The method is principally aimed at increasing pupil perseverance by providing incentives for pupils to encourage and help one another to master curriculum material (Slavin, 1983a). Research comparing team learning with conventional methods has found that pupils taught with the former method consistently attain at a higher level, and has established that this is primarily due to the team incentives offered rather than to other features of the method (Slavin, 1983b).

Clearly these three approaches to instruction each imply quite different patterns of differentiation in the curriculum. In addition, we are currently seeing the (re)emergence of a new competitor in the form of computer-assisted instruction in secondary schools, and this may generate further forms of curriculum differentiation. Computer assisted instruction has been widely researched in the past and found to have had mixed results. This research, however, was principally concerned with the evaluation of methods of programmed instruction using computers. More recent practice based developments in the use of computers employs them in other ways in the teaching-learning process. However, their potential

may lie in their integration into other instructional methods, eg. in the remedial phase of mastery learning. Treated as competitors each method has its adherents who believe in its superiority over other methods, however, it is likely that teaching practices will emerge which seek to integrate the best practices from each.

The literature on SIP programmes suggests that some of the features of these methods, particularly their emphasis on the regular monitoring of pupil progress, the setting out of a clear statement of learning objectives, and an increase of time on-task, are supported by the findings reviewed above, however, a focus on basic skills may be sub-optimal in the sense it may unnecessarily retard the rate of progress of faster learners if instruction takes place in heterogeneous classes. Many school improvement programmes prescribe heterogeneous classes on the basis of research that suggests that they provide a more favourable peer environment for the less able and because they are thought not to seriously affect the performance of more able pupils.

Discussion

During the last two decades the dominant research perspective on effective schooling has changed from one that primarily addressed concerns about the inequality of educational outcomes in Western societies, to one which today is concerned primarily with the efficiency of schooling as an organisational enterprise. This change has come about for a variety of reasons. First, the findings from the inquiries into the inequality of educational opportunity suggested that variation in the home and social background of pupils was a far greater influence than schools on variation in pupil attainment. The essence of that finding is still valid today. Second, the changes in the economic and social structure in which schooling has to operate have generated a new policy agenda of reforms and concerns. Third, a contraction in the size of the pupil cohort following the exit from the system of the generation who formed the post-war baby-boom has refocussed concerns on to the problems of managing schools in a situation of declining

enrollments. Thus, the policy research agenda of the late 1980s looks quite different to that of the late 1960s.

The policy concerns of the late 1980s relate primarily to schools as organisations, rather than to schools as social institutions with the power to liberate individuals from the *cast* of social class that they are born into. As part of this orientation, the way in which schooling is delivered has become a focal concern. This has resulted in a research orientation that is primarily concerned to understand how organisations work, and how policy interventions that lead to a more efficient school system may be successfully implemented. Hence, the focus on management and leadership. This is not all for the worse, as one of the emergent reasons for the failure of policy interventions in the late 1960s and the 1970s to bear their expected fruits is their failure to come to grips with the actual process of change itself. In any case, the political forces that shape the policy agenda have to be accommodated, and in the current climate this means understanding how schools as organisations change.

Further, the interest in schools as organisations has lead us to the understanding of schooling as a multi-level structure, in the conceptual sense. That what is taught in a given classroom is determined, in part, at some level higher up in the system through the processes that allocate teachers and pupils to classes. The pace at which that curriculum is covered, and the teaching methods employed are then significantly determined by characteristics of the classroom, its pupil composition and the skills of the teacher. However, the outcome at the classroom level is the realised coverage of the curriculum, while at the pupil-level the outcome is the degree of new learning that has taken place. This concepualisation of schools as having a multilayered organisational structure has required the development of new statistical modelling techniques, which are discussed in chapter 5.

Perhaps as a consequence of the changes discussed above, a range of educational changes recently introduced have meant that the substance of the outcomes of schooling have also changed from

those of two decades ago. The collapse of the youth labour market, the introduction of a new curriculum and assessment system, alternative routes through school and post-school educational careers, and greater choice in the selection of schools have changed the processes that underlie effective schooling in Scotland. Collectively these changes probably amount to as significant a change in the structure of education as that introduced by the move from a selective to a comprehensive system of schooling in the late 1960s and the 1970s.

The data available for the present study pre-date these later changes, and they allow us to investigate the nature of variation in the system before these forces of change were able to influence it. This allows the study to deal with two particular aspects of variation that will be more difficult with data collected at a later time. First, it allows for the methodological development of a system that provides a better assessment of variation in the system; both variation between schools, and between school sectors. The discussion in chapter 5 of the deficiencies of previous methods for assessing variation will focus on the multi-level nature of the system. Second, it allows a baseline estimate of variation in performance between schools and sectors. This is important because we do not have estimates of variation between schools and sectors for earlier periods, for example there are no estimates of the degree of variation that existed prior to the comprehensive reforms of the late 1960s and early 1970s. The present study will assess the extent of variation that existed between various sectors of scholing in the late 1970s. For this purpose a typology of school sectors is derived from an historical perspective in chapter 4

Chapter 3

Previous Research on Variation in Attainment Between Educational Sectors

Introduction

The purpose of this chapter is to review studies of variation in the effectiveness of educational sectors. The literature on effective schooling reviewed in the previous chapter has, in general, ignored the variation in effectiveness among the different sectors of schooling. Most interpretations of the findings from this research have also ignored the potentially confounding effects of variation that is sector specific, and have thereby assumed that all schools in the system belong to the one single sector. While it is true that most of the research reported in the previous chapter has studied only public comprehensive schools, there may be subgroups of schools even within this sector whose particular characteristics are responsible for some of the variation in pupil outcomes. This does not necessarily imply that sectors based on such subgroups of schools are of a different nature. But that any fully adequate typology of educational sectors is likely to be multidimensional. For example, in the Scottish context it may be relevant to define sectors based on the church or secular affiliation of schools, which would cut across the more familiar policy based classification based on comprehensive and selective schools. For the purposes of this study the term *sector* is employed to refer to subgroups of schools which are homogeneous in terms of some external policy of other typological framework.

Studies of sectorial variation have, however, not been much better at taking a conceptually broad view of the variation between schools that they have studied. This deficit in both types of study has stemmed from their failure to conceive of the organisational framework in which schooling takes place as that of a multilevel system, with units at each level operating within

a hierarchically structured system of pupils, classrooms, curriculum departments, year groups, schools, educational authorities, etc. This hierarchical view of the organisation of the school system has emerged only recently (Barr and Dreeben, 1983; Bidwell and Kasarda, 1980, Burstein, 1980). As we shall see below, none of the major studies of variation between sectors has explicitly taken account of the fact that pupils are taught within schools, preferring to deal only with pupils on the one hand and the sectors on the other. This stems partly from the fact that such studies have not sought to understand the reasons for the variation between sectors in terms of the variation between schools in those sectors, but it is due principally to a relatively single-minded focus on the evaluation of the *effects* of particular educational *policies*. Thus, in contrast to the research on effective schooling, which has sought to understand the organisational and pedagogical processes that give rise to the variation in the effectiveness of schooling, research on sectorial variation has sought to do little more than assess the difference in performance of given sectors. From a policy perspective the differences between sectors are often subsequently assumed to be constant across all schools within each sector. Current research has recognised this lacuna in the field and is seeking to unify the research knowledge and methods that have been employed in these two domains.

Two sets of studies of variation between educational sectors are now discussed. The first of these is the study by Coleman and his colleagues of public and private schooling in the US, and the various critiques and extensions to this work that have since been published. The discussion will focus primarily on the original study and the set of critiques that were published in a special issue of **Sociology of Education** in 1982. These critiques serve to illuminate the findings and the various substantive and methodological issues that are germane to this area of research. The second group of studies discussed are those that evaluate the performance of the selective and comprehensive sectors in the UK. The main work here has been done by Steedman

(1980, 1983) on data for schools in England and Wales, and by Gray *et al* on data for Scottish schools. Other British studies of lesser scope that will also be discussed as a means of highlighting certain issues. The US studies have generally been able to draw upon far more detailed and comprehensive data than the British studies, and have been conducted in a more sophisticated methodological framework. They have also been set within a context of vigorous critical debate of a nature that has been lacking here in the UK. This debate about the theoretical and the methodological basis of the studies has considerably advanced our understanding of the issues, and the issues raised by these critiques will be discussed later in the chapter.

US Research on Public and Private Schooling

This section summarises the study conducted by Coleman and his colleagues (Coleman, Hoffer, and Kilgore, 1982a,b). Their study was based on the 1980 High School and Beyond survey of 30,030 sophomores and 28,240 seniors in 1,122 American High Schools. The survey sampled 36 sophomores and 36 seniors in each school, and the achieved sample represented 84% of the target sample. It includes data on pupils in 893 public, 84 Catholic, and 27 other private schools. The survey collected data on a wide range of pupil and school characteristics. A set of cognitive tests of attainment in mathematics, vocabulary, reading, civics, writing, and science were also administered to pupils.

The study published by Coleman *et al* (1982a,b) was based on pupil test scores for a subset of eight items that appeared in both the sophomore and senior tests in mathematics, reading, and vocabulary. They chose to use data on this shortened form of the test so that they could evaluate sophomore to senior year growth for the synthetic cohort of pupils for whom data was available from this cross-sectional survey. They evaluated the

performance of pupils in each of three sectors defined as the public, Catholic, and 'other private' sectors.[1] The average level of attainment for sophomores in the Catholic and other private sectors was considerably higher (by about a third of a standard deviation) than those in the public sector. In fact, the average level of performance for *sophomores* in the private sector was almost as high as that for *seniors* in the public sector. However, there was also substantial variation between sectors in the characteristics of their pupil intakes, therefore there was the possibility that the performance differentials in favour of the private sector may have been due to their advantaged intakes, rather than to any particular qualities associated with the schools in that sector. For example, in the other private sector 63 percent of the pupils came from homes with an income of greater than $20,000, while 58 percent of pupils in the Catholic sector and only 41 percent of those in the public sector came from homes with incomes of that level. There were also substantial differences in the socioeconomic and the racial composition of the intakes among sectors, and significant variation among schools within sectors in the distribution of pupils on these characteristics.

Three approaches were employed to assess whether there were differences in the performance of the three sectors. First, the sector differences were estimated after taking account of the differences in the pupil intakes between them. Second, the data for sophomores and seniors was treated as a synthetic cohort and the differences in their performance compared between sectors. Third, various models of school characteristics that may have been responsible for producing the differences between the sectors were investigated. All of these approaches required that the differences in pupil intakes among the sectors be taken into account, although this was less crucial in the second approach, as

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[1] In this chapter the term 'private sector' is used to refer to the combined Catholic and 'other private' sectors.

the sophomore score was used to adjust for initial differences in intake between sectors.

The controls employed to adjust for the variation in intakes among the three sectors consisted of seventeen measures of pupil background and family characteristics. Ten of these measures were thought to be clearly prior to schooling in terms of any causal influence that they might have on pupil attainment: family income, mother's education, father's education, race, ethnicity (Hispanic/non-Hispanic), number of siblings in the family, number of rooms in the home, both parents present, mother worked before child was in elementary school, and mother worked when child was in elementary school. The other seven were not clearly prior to schooling in any causal influence that they might have had: encyclopedia or reference books in the home, more than 50 books in the home, typewriter in the home, pupil owned a pocket calculator, frequency of talking with mother or father about personal experiences, mother thinks student should go to college after high school, father thinks student should go to college after high school.

Controlling for this set of seventeen pupil and family characteristics reduced the estimates of differences in pupil performance between the public and private schools by about half. However, there was still the possibility that some relevant extra-school factor remained unmeasured. If there was some further factor that influenced the allocation of pupils to sectors and which also influenced pupil attainment, these adjusted estimates of the differentials in performance between the sectors could still have been too high. It was for this reason that the second approach that treated the sophomores and seniors as a synthetic cohort was employed. The researchers argued that any unmeasured background factor that had not been controlled for by the set of 17 measures employed in the first approach, but which influenced both the selection of pupils to the sectors and their attainment once there, would be taken care of by utilising the sophomore test score as a pretest for the assessment of gains in

the two years between sophomore and senior year. Although on the surface this approach would appear to be able to attain its objectives, there were two particular problems with it. First, there are differential student dropout rates across schools between the sophomore and senior years. Second, as the data available were not for the same pupils at two time points, it was not possible to estimate individual pupil growth over the two years. Coleman *et al* adjusted the attainment levels in each sector for the differential dropout rates and then estimated the average gain for each sector between sophomore and senior year.

Their analyses based on this second approach also indicated that attainment was higher in the Catholic and other private sectors than in the public sector. The differential between the public and Catholic sectors was of the order of one third of a grade level for a pupil of average public sector background characteristics.

Their third approach was to model the factors that supposedly cause the differences between sectors, after taking account of the difference in intakes. The rationale that lies behind this approach is one that argues that where differences in school characteristics can be shown to be associated with the variation in pupil performance between sectors, it is less likely that the differences are related to selection effects that have been omitted in the specification of the model. The types of omitted selection factors that could challenge the findings from such an analysis would need to be correlated with both school characteristics and differences in intake between sectors. The findings from this approach confirm those from the two earlier approaches. The school-level factors that were found to be associated with sector-level variation in pupil performance are: coursework, homework, attendance, disciplinary climate, and student behaviour. Not all of these five factors were, however, found to be important for sector-level variation in both sophomore and senior student achievements. Student behaviour was found to have the strongest influence on pupil performance,

while disciplinary climate was not found to have any direct effect, but only an indirect effect through its influence on student behaviour. If the higher levels of these factors found in schools in the Catholic sector were translated into the schools in the public sector, then we would expect to see an increase in the level of attainment among public sector pupils. Likewise, if the private school levels on these factors was lowered to the level that exists in the public school sector, then the attainment levels of private school pupils would be expected to fall.

British Research on Selective and Comprehensive Schooling

The two main studies of the comparative performance of selective and comprehensive schooling are now discussed, along with some additional studies of variation between sectors in UK school systems. The main study of selective and comprehensive schooling is that based on the longitudinal data collected by the National Childrens Bureau (NCB) from a probability sample of children born during one week in March 1958. Steedman (1980, 1983) published two studies that evaluated the variation between different types of schools in 1974 when these individuals were 16 years of age. The other major study is that conducted by Gray *et al* (1983) for a sample of pupils in Scotland a decade after the initiation of comprehensive reorganisation in Scotland. Both studies provide a comparative evaluation of the performance of pupils in the comprehensive school system and the selective system at a time when the progress towards comprehensive reorganisation was only partially completed. Since that time the process has reached completion in Scotland, but progress towards a fully comprehensive system has been moribund in England and Wales since the late 1970s. The above two studies will be referred to as the Steedman (1980, 1983) and the Gray (Gray, McPherson and Raffe, 1983) studies, respectively.

A problem encountered by both studies was the classification of schools that were in transition from their previous status to

comprehensive schools. Steedman classified all schools which had not completed the transfer of status by establishing a non-selective intake by the year in which her sample members entered them, but which did so subsequently while these pupils were attending them, as a separate 'transitional' sector. Gray, on the other hand, classified such schools as belonging to the selective sector. Both studies sought to evaluate the performance of comprehensive schools against all other schools that were non-comprehensive. The rationale for this split of schools into two sectors in both studies was that this division of schools effectively represented the two policy related alternative systems: a selective sector, comprised of schools that were selective in terms of their entrance requirements plus the group of schools that were necessary for those not admitted to these selective schools, and a fully comprehensive system. In England and Wales the non-selective component of the selective sector comprised principally the *secondary modern* schools, the technical schools having been omitted from the classification schema, while in Scotland the non-selective component of the selective sector was drawn mainly from the schools previously referred to as the *junior secondary* schools. The schools classified as belonging to the selective sector differed in the two studies. In England and Wales they were the *grammar* schools, while in Scotland they included the *senior high* schools, the *Grant Aided* schools, the *Local Authority selective* (in some instances these were 'fee-paying') schools, plus schools classified as 'receiver' schools within particular subsystems that were operating at the time. There was, however, a further substantial difference in the way the two studies classified their schools. Steedman classified all schools under the forgoing definitions as comprehensive, transitional, or grammar schools independently of the degree of selection that operated on the intake of pupils to a school. She stated that the objective of the study was not to assess how a fully fledged comprehensive system unencumbered by the effects of selection would perform, but rather to assess the performance of the different sectors within the particular temporal and organisational context that applied at that

particular stage of the transition to a comprehensive system. In the Scottish study the comprehensive sector was, however, defined by the set of schools that had completed the transition to comprehensive status *and* were also not subject to 'creaming' by selective schools. The selective sector was then defined as all the remaining schools in the system. Thus, by the standards of the Scottish study a proportion of the comprehensive schools in Steedman's study would have been classified as part of the non-comprehensive sector. It is difficult to know how this would have affected the findings from Steedman's study, but on the basis of additional knowledge, we can conjecture how it may have influenced the findings obtained from the Scottish study.

The Gray study did, however, attempt to assess the effectiveness of a comprehensive system in comparison with a selective system, with the *proviso* that the effectiveness of the comprehensive system may take further time to mature. The constraint that schools had to be situated so as not to be under the influence of creaming from selective schools, however, meant that they classified all schools in the cities of Dundee, Edinburgh, and Glasgow, plus schools in a few smaller localities, as part of the selective sector, which meant that only 56 percent of the pupils who were attending comprehensive schools were classified as belonging to the comprehensive sector.

Steedman's study of comprehensive and selective schooling in England

Steedman's study, as indicated above, was based on data collected as part of the NCDS longitudinal study of child development (Fogelman, 1976). The section of the longitudinal record on which Steedman based the study contained measures of pupil attainment and the social background characteristics of their family at eleven years, plus the measures of attainment and other educational outcomes at sixteen years. These data were available for a sample of 8,702 pupils who remained in the study from the 16,000 in the original 1958 birth survey cohort. After omitting pupils in independent, direct grant, and a small group in

other types of schools there were 7,866 pupils for whom a complete record of the variables employed in the study were available for the eleven year old data sweep. However, the study was conducted using the data for only 4,375 pupils, the remainder having been dropped from the sample because they did not have a complete record of data at sixteen. [There were 747 pupils in the grammar school sector, 1213 in the secondary modern sector, 936 in the comprehensive sector, and 1479 in the transitional comprehensives sector. Compared to national statistics available for 1974, the year in which the sixteen year old data was collected, this represented a significant over-representation of grammar school pupils (26%, as opposed to 12% nationally), and an under-representation of secondary modern pupils (Steedman, 1983). The net effect of this imbalance in the sample was to bias the performance of the combined selective sector in an upward direction, in comparison to what would have been expected on a national basis. However, the proportion of pupils in comprehensive schools was merely a reflection of the state of the system at that point in its reorganisation to a comprehensive system, thus any readjustment of the proportions in either sector would have been arbitrary. Further, the schools that had established themselves as comprehensives were not a random sample of those that were likely to comprise the future comprehensive sector. Those that were established as the early comprehensives were more likely to be rural schools (Eggleston, 1977), or those in Labour controlled local authorities (Steedman, 1983). Providing the factors influencing pupil selection into each sector could be fully taken into account, this situation would not affect the estimates of performance in each of the constituent subsectors of the selective sector: although, as implied above, it would influence the estimate of the performance of the selective sector as a whole as that depends on the relative weighting of the grammar and secondary modern schools in the overall estimate. As the study had available to it measures of pupil attainment at eleven years of age, plus other measures of family background, there was a strong case for arguing that selection factors affecting enrollment in each sector were relatively well

controlled for in the analysis, and that the performance of each type of school could be estimated reliably.

As Steedman indicated, the study should not be viewed as an evaluation of the performance of comprehensive and selective schools as independent sectors, but rather as a comparison of the performance of comprehensive, grammar, and secondary modern schools all existing within the one system. Viewed in this perspective the Steedman study is thus similar in design to the Coleman *et al* study of public, Catholic, and other private schooling in the US discussed earlier. Both are comparative studies of the performance of sectors that exist simultaneously within the one system. Pupils have a choice of attending a school in any one of the sectors, and the evaluation is not directed at a quasi-experimental assessment of whether a system based entirely on one or other sector would provide the highest level of pupil performance. It follows from this that any interpretation of revealed differences between the sectors should be restricted to extrapolation at the margins only, not extrapolated to the extreme alternative under which one or other sector was assumed not to exist. For example, the removal of comprehensive schools in Britain, or private schools in the US would imply such a broad social restructuring of schooling and inferences based on the present system could only be of a highly speculative nature. Perhaps the only thing that might be safe to conjecture is that, given the resilience of social arrangements to change, many of the social structures of schooling and their associated behaviours would reappear in the reorganised system. In this context it is useful to note that Gray argued that the differences in social class inequality in attainment that was observe between the comprehensive and selective sectors were not due to comprehensive reorganisation, but rather to differences in social class opportunities in certain communities that predated reorganisation.

Steedman's analyses included an investigation of the variation in pupil background and of the raw examination

performance of pupils in the three sectors.[2] The grammar school sector contained a much higher proportion of pupils from non-manual social class families than the comprehensive sector, which in turn contained a higher proportion than the secondary modern sector. This profile of sector intakes was also reflected in the pattern of eleven year old attainment scores of pupils. Further, this difference in intakes was reflected in the ordering of pupil attainment profiles among the sectors. Steedman estimated the performance of pupils separately for each sector using the first approach described earlier in the discussion of the US studies of private and public schooling.[3] However, her study had stronger statistical controls for the factors that may have influenced selection into each sector. Although she did not employ as long a list of pupil and family background measures, she did use a measure of pupil attainment at age eleven as a measure of pupil characteristics. Examination results were the main outcome studied, and these were scaled in various ways to test whether the results of the study were sensitive to the metric of the outcome variable employed. The data were analysed separately for pupils who had entered for an examination, and for the whole sample, inclusive of pupils who had not entered for any examinations. The sample that was restricted to examination entrants only was thought to be appropriate particularly for the single subject outcomes of English and mathematics, while the complete sample provided a basis for a measure of overall performance across all subjects, after taking into account the equivalence of different types of examinations.[4] Although there

[2] The transitional comprehensives were not considered in the main part of the study.

[3] There was, however, a difference in the statistical techniques employed in the US and British studies. The US study employed the technique known as regression analysis, while the British study used three techniques. The first two methods were employed because the examination results were scored on a categorical as opposed to an interval scale; the first was based upon stratifying the sample into percentiles grouped into five equal classes, and the second was a log-linear analysis. Where the outcome variable was treated as continuous a third method based on the regression model with dummy variables representing sectors was used.

[4] The study took account of performances in the General Certificate of Education (GCE), and in the Certificate of Secondary Education (CSE O & A levels).

was some variation in the relative differentials in attainment among the three sectors, the finding that followed from almost all analyses was that the pupils in grammar schools attained at higher levels than those in comprehensive schools, who in turn performed at higher levels than those in the secondary modern schools. This held true for pupils at most levels of the background characteristics, with the qualification that the grammar schools enrolled few pupils in the lower half of the eleven year old attainment distribution. There are some exceptions to the general conclusion for pupils in comprehensive and secondary modern schools. In particular, pupils who had the lowest eleven year old attainment levels performed as well in the secondary modern school sector as they did in the comprehensive sector. Overall, Steedman concluded that "for the half of the pupils who were obtaining 'O' level equivalents, the average advantage attributable to being in a grammar rather than a comprehensive was less than two thirds of an 'O' level equivalent. The average advantage of being sent to a comprehensive than to a secondary modern appears to work out at a little over a third of an 'O' level equivalent." (1983. pp 144).

Gray's study of comprehensive and selective schooling in Scotland

The study by Gray *et al* of differences in performance between the comprehensive and selective sectors in Scotland was based on a sample of 16,851 leavers from all secondary schools in four of the nine Scottish regions. The regions were Fife, Lothian, Strathclyde, and Tayside which between them account for about three quarters of the Scottish population. As indicated earlier the classification of schools into comprehensive or selective categories also sought to take account of the effects of selectivity on the intakes of comprehensive schools. Only schools that were not likely to have been creamed of their more able or advantaged pupils by schools in the selective sector were classified as comprehensives for the purpose of the study. Unlike the distributions of pupils between sectors in the US studies

discussed earlier, or in Steedman's study, there was no discernible variation in the distribution of pupils between sectors in terms of their social class characteristics. Gray *et al* did not have the benefit of a strong pupil background control measure such as attainment at eleven years as in the Steadman study, or of the additional measures available in the US study, and they proceeded on the basis that if the social class composition was similar in the two sectors then it might be reasonable to assume that there were no other significant factors influencing selection to them. On this basis they pooled the data for pupils within each sector and analysed pupils' examination attainments on an overall measure of their performance in the Scottish Certificate of Education examination (SCE).

Their findings suggested that there was little difference in the performance of the two sectors for higher attaining pupils, but some difference for the lower attaining pupils. The proportion of pupils gaining one or more passes in the Higher grade examination was the same (25%) in both sectors, but a further 37 percent of pupils in the comprehensive sector gained one or more passes in the Ordinary grade examination, while fewer (28%) attained at a similar level in the selective sector. The offsetting differential was in the proportions gaining no passes at all: thirty one percent in the comprehensive sector, and thirty seven percent in the selective sector. The study did not take account of pupil entries in other examinations. It is probable that a small proportion of the pupils in the selective sector gained passes in an English GCE O or A level examination, while there may also have been a small proportion of pupils who gained passes in English CSE examinations.[5] One of the main findings of the study was that the social class differentials in performance were greater in the selective sector than in the comprehensive sector. However, by analysing additional data on

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[5] The more selective schools in the cities enter some pupils for A levels, and one of the four regions entered some pupils in CSE at the time.

the subset of pupils who attained passes in the Higher grade examination it was found that this pattern of within-sector differentials predated comprehensive reorganisation, and was apparent in data available for this set of schools as far back as 1962. Gray suggested that the reasons for the existence of this differential were to be found in their classification of schools into comprehensive and selective sectors. A significant proportion of the schools classified as belonging to the comprehensive sector were formally 'omnibus' schools serving the whole of a local community, and all the schools in the main cities were classified as selective, due to the presence of selective schools in those areas.

The finding that there were differences in social class inequality in the two sectors suggests that, in the terminology to be developed later, the regression slope of attainment on social class was flatter in the comprehensive sector than in the selective sector. If this was indeed the case we can deduce that the regression lines for the two sectors would cross over each other at some point just above that of the average social class pupil. Support for this is available in the finding that "[c]hildren from social classes I and II achieved rather better SCE results at schools in the selective sector than at schools in the comprehensive sector. Children from each of the three manual classes, and the unclassified children, did better in the comprehensive sector than in the selective sector" (Gray *et al,* 1983: 257). This raises the interesting issue of the type of pupil for whom the variation in the system is evaluated. The fact that the regression lines for the two sectors may not be parallel implies that the differential in performance between the sectors varies depending on the social class of the the type of pupil for which it is evaluated. Since the samples for the two sectors had similar social class distributions, the main findings relate to a pupil of average social class. The existence of different within-sector slopes may, however, be a property of each sector that is as important as the difference in attainment for such an average pupil. This feature of differences between sectors is also

relevant to the Steedman and the Coleman *et al* studies discussed earlier, and is discussed later in the chapter.

Other British studies of variation between school sectors

Several other British studies of lesser scope have attempted to assess variation between educational sectors. The studies by Marks *et al* (1983, 1985) and Gray *et al* (1987) are both based on aggregate data about schools, and in the case of the former, partly on data aggregated at the local authority level. The Marks *et al* studies attempt to evaluate the performance of comprehensive and selective schooling, but uses Census based data at the local authority level to adjust for variation in the intakes to the sectors. Further, they are unable to identify schools as belonging to sectors; only local authorities having different concentrations of pupils within each sector. This is a serious drawback as different local authorities vary in terms of their social class distributions in comprehensive and grammar schools, and a global adjustment for social class mix at the authority level is unlikely to provide an adequate control for the pupils entering each sector.

Gray *et al* (1987), and Willms (1986) have attempted to evaluate the differences in local authority performance. Gray *et al* employed data aggregated to the school level while Willms employed pupil-level data. It is now widely recognised that aggregate school-level data are an unsatisfactory basis for the evaluation of the effectiveness of schools, for reasons that will be demonstrated in chapter 5. This, in addition to the fact that the study ranked the authorities without any reference to the reliability with which the estimates had been derived severely restricts the veracity of any conclusions drawn from it. On the other hand, the study by Willms is based on pupil-level data and takes account of the multi-level nature of the system. He reported that only a small fraction of the variation in pupil-level outcomes lies between LEAs, but found that there was a strong consistency in the performance of these Scottish LEAs relative to

each other over three time points spanning the decade 1975-1984. However, the study was based on all schools in the system and allocated an LEA identifier to each school on the basis of the school's location. By basing the analysis on all schools this study does not reflect the administrative structure through which schools are governed. In particular, the inclusion of schools that are not administered by LEAs, the independent schools, may have influenced the findings. The policy evaluation perspective employed by Willms meant that his prime focus was on the mean level of performance of the LEAs, and he paid little attention to the pattern of variation within them.

McPherson and Willms (1986) also reported an evaluation of variation between educational sectors. Their focus was on variation between Catholic and non-denominational schools, and on sectors defined by the period in which schools were established. Like all of the studies reviewed above, with the exception of Willms (1986), this study did not take account of the variation that lies between schools within sectors. It used data pooled at the sector level, and constrained within-sector slopes to be the same across sectors. Based on a large sample of leavers surveyed in 1981 the study found that for an average pupil in the population the Catholic sector had a higher level of performance than the non-denominational school sector, and that older established schools had a higher level of performance than those established more recently. The analyses presented in later chapters employ the same data as this study, but are based on a model that recognises the variation that lies between schools within-sectors, as well as that which lies between-sectors.

The Explanation of Variation in Sector Performance

Of the studies reviewed above, only the Coleman *et al* study explicitly attempts to explain the causes of variation in performance between sectors in terms of differences in the teaching and learning situation within schools. The third of the approaches that they employ to evaluate differences in

performance between public and private schools employs school-level characteristics to explain sector performance. They find that factors associated with coursework, homework, attendance, disciplinary climate, and student behaviour explain some of the variation in sector performance. Lee (1986) also reported that coursework and disciplinary climate were significant determinants of sector variation between public and private schools in the US.

The studies reported by Willms (1986), and Willms and McPherson (1986) account for variation in sector performance through differences in the composition of school intakes among the sectors. Clifford and Heath (1984) also argue that such factors may be associated with sector variation, and Raudenbush and Bryk (1986), and Lee (1986) found that the average socioeconomic status composition of schools accounts for some of the variation between the Catholic and public sectors in the US. The latter two studies are the only ones among those cited to model the multilevel nature of the system, and hence to accurately assess the impact of compositional influences on sector performance.[6]

There is, however, a more important conceptual issue that raises serious questions about all attempts to explain variation in sector performance by measures based on the composition of school intakes. This is the question of what school composition means in a substantive educational framework. It is difficult to know whether compositional effects reflect unmeasured pupil characteristics, or particular features of the relationships between school process and school composition. The former set of relationships are often referred to as *pure composition* effects, while the latter are referred to as *contextual effects*. If

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[6] The McPherson and Willms (1986) study was based on a model that ignored the multilevel structure of the data, and it is difficult to assess whether its finding that compositional effects are related to variation between sectors is valid, as the standard errors produced from such an analysis are incorrect.

compositional effects represent nothing more than pure compositional effects, then they cannot be part of any substantively educational explanation of the differential performance of sectors.

Some time ago Erbring and Young (1979) conducted an analytical study of the concept of contextual effects. They suggested that such effects, if they exist, reflect either social-psychological features of the interaction between pupils within schools, or, alternatively, that they reflect the adaptation of teaching to the educability of the pupil intake. They developed a range of analytic models of potential processes that might underlie such effects. The standard contextual effects model suffers from the weakness of implying a direct relationship between aggregate characteristics of a school's composition and pupil attainment. They refer to it model as the *social telepathy* model of contextual effects because of its failure to link the macro social context to the micro social environment of individual action. They suggest four further models of processes which might mediate the influence of context. These are: (1) the common-fate model of indirect effects, (2) the social norms model of context, (3) the common-fate model of spurious effects, and (4) the feedback model if interactive effects between pupils in a given context. Only the common-fate model of indirect effects, the social norms, and the feedback models attempt to explicate the influence of context in terms of processes which operate at the micro-level (pupil-level) within schools. The common-fate model of spurious effects indicates the potential for other processes operating between schooling and other social institutions to have effects which are related to the composition of school intakes, even though such processes may not be attributable to particular social-psychological or pedagogic processes in the teaching and learning context.

Hauser (1974) argued that most compositional effects are due to what were earlier referred to as *pure* compositional effects, and that they represent nothing more than unmeasured

pupil characteristics. He suggested that the validity of studies which attribute the influence of intake composition to social or pedagogic processes that take place in the school may be particularly susceptible to processes of selection which determine the allocation of pupils to schools. Even if research can demonstrate a relationship between the characteristics of school intakes and social- psychological processes operating within schools, or between these and particular pedagogical practices which vary across schools, Hauser's challenge threatens the validity of all arguments which seek to attribute an independent influence to school context as one of the determinants of pupil attainment.

A critique of studies of variation in sector performance

The forgoing exposition and discussion of studies of sector variation in performance described the substantive and methodological frameworks in which such studies have been undertaken. Various issues that were germane to the validity of individual studies were dealt with in the discussion of each study. This section returns to some of the general issues raised in that discussion and draws on the literature that has critically evaluated these studies as a means of illuminating the main issues in all such studies. The discussion focuses primarily on the issues raised by the critiques of the study undertaken by Coleman and his colleagues in the US. Three issues stand out as the principal challenges to the validity of all of the studies reviewed. These can be described as the issue of selection effects, the issue of an appropriate measure of school outcomes, and the need to allow for variation in within-sector slopes among sectors.

Selection effects

Selection effects relate to the appropriate specification of the pupil-level characteristics that influence the allocation of pupils to sectors. If pupils of a particular type are predisposed toward one or other sector and if the characteristics of such pupils are also related to their attainment in school it is necessary to control for these characteristics before evaluating the performance differentials between sectors. The solution is to model prior attainment, or to model the selection process itself. In modelling the selection process the omission of a background variable that is correlated with prior attainment but not with sector choice, or the omission of a background variable that is correlated with sector choice but not with prior attainment should not bias sector effects (Cain, and Goldberger 1983). Thus, full statistical control over either prior attainment or sector choice will suffice to provide unbiased estimates of sector performance.

Most of the critiques of the Coleman *et al* study have focussed on this issue. Cain and Goldberger (1983) suggested that because there are considerably fewer pupils in vocational tracks in the Catholic schools that such pupils would be over-represented in the public schools, and that would influence the estimate of the performance of public schools because entry to a vocational track may be related to prior attainment. It is because of this possibility that Alexander and Pallas (1983) employed 'track' as one of the variables in the model. They argued that the track selected by a pupil is a proxy for unmeasured pupil characteristics, but Coleman *et al* were able to provide evidence to suggest that it was a school policy related variable, and hence should not be treated as a prior control in any evaluation of differences in performances between sectors (Coleman *et al,* 1983b). In reality it is probable that track selection is correlated with pupil background characteristics, but this does not make it a valid proxy for unmeasured intake characteristics of pupils.

Noell (1982) suggested that the study should have controlled for a different set of pupil background characteristics, in addition to the seventeen that it did control for. He suggested that sex, handicap status, region of residence, expectations for early college attendance, and scholastic aptitude should be controlled for. There was no measure of the last of these in the data set for the study, but he also suggests that the long list of pupil characteristics that were controlled, plus the additional four that he suggested, would suffice.[7] Noell found that the inclusion of these additional control variables in the model reduced the magnitude of the differences between the sectors. Only the difference for attainment in reading remained statistically significant. He then employed a more complex model which formally modelled the selection process (Heckman, 1976) but found that the estimate of the Catholic school effect for reading actually increased under this model. However, Noell found these results for a subset of the data that related only to those pupils who had complete data records on all variables in the model. This reduced the sample size by a third to a half, depending on the particular model estimated. Although there are usually cautions associated with the use of pairwise deletion of missing data in such models, the method employed by Coleman *et al,* Noell provides no evidence that the sample analysed by adopting a listwise approach to deleting cases with missing data was representative of the original sample. Such data is rarely missing at random, and one would normally expect this method to result in a sample that was biased upwardly in terms of pupil socioeconomic status, thus affecting the estimates for public schools more than those for Catholic schools. Coleman *et al* (1982b) reanalysed the data and included the two main variables

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[7] Since these critiques were published a further wave of data has been collected from this sample of pupils. Studies that employ the sophmore test scores as controls for the senior year test scores continue to show that even over this two year period the Catholic sector effect is greater than that for the public sector. There is considerable debate whether the differences between the sectors over this two year period are of substantive significance, and whether they will confer an enduring benefit on pupils who have attended schools in the Catholic sector (Jencks,1985).

suggested by Noell's analysis in their modified model, but they found that the Catholic school advantage was not substantially reduced by this modification.

The British studies have dealt with the selection problem in rather different ways. The Steedman (1980, 1983) studies are based on data that contained measures of prior attainment and social class, and while this does not make it immune from problems due to selection effects[8], it does mean that most of the exogenous influences associated with pupil characteristics and family background will have been controlled for in the estimation of differences in sector performance. The major issue in relation to selection effects in this study is the high rate of attrition from the sample between the ages of eleven years and sixteen years, and the further omission of some of the sixteen year old sample due to problems with missing data. With such a large proportion of the cases being deleted from the original sample, even the control for prior attainment may not have resulted in adequate adjustments for differential attrition across social class and other dimensions. In addition, the fact that it was not possible to reweight the sample within and between sectors makes any inferences about the differences between sectors rather difficult to defend. For example, if the attrition affected the comprehensive schools more than, say, the grammar schools, then it may have resulted in an overestimate of the performance of the former sector relative to that of the latter. As Steedman pointed out, there was no *a priori* basis on which she could have devised a reweighting scheme, particularly in relation to the appropriate numbers in the combined selective sector (Steedman, 1983; p13). Thus, as indicated earlier, the study should not be treated as an reliable indicator of differentials in the

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[8] There may still, for example, be differences in the intake to the three sectors in terms of such factors as ethnicity, parental encouragement, pupil attitudes and aspirations, etc, even after control for prior attainment. However, these factors are usually thought to be considerably less influential as determinants of pupil attainment than those for which measures were available: prior attainment, and social class.

performance of the comprehensive and selective sectors, but rather as a description of the differentials between the constituent parts of those sectors for the sample of pupils who remained.

Gray *et al* (1983) did not have a measure of prior attainment available to them. The fact that their two sectors had almost identical social class distributions meant that the overall distribution of social class was not likely to affect the difference in performance between sectors. However, there may have been variation in the relationship between social class and attainment across schools within each sector. The fact that there was variation in slopes between attainment and social class at the sector-level suggests that the assumption that social class effects were fully controlled is unwarranted, but since there is no additional data available for their sample, it is not possible to assess whether there were other differences in pupil intake characteristics between the sectors.

Appropriate measures of school outcomes

Although its often seems obvious what the outcomes of schooling are, there is a wide range of divergent views of which of these should be employed in assessing variation in attainment between sectors and between schools. By its very nature the concept of effectiveness implies a comparison among schools either directly, or via some external criterion.

British secondary school systems, unlike their counterparts in many other countries, have one feature that at some stage plays a dominant role in the life of most pupils that pass through them, the preparation for and presentation for public examinations. The attainment of pupils in these public examinations provides a prominent measure of both pupil and school academic success. Regardless of whether or not one approves of examination outcomes as the basis of assessments of the effectiveness of schools, they are subsequently used in the

selection and channeling of pupils in post-school educational and occupational careers, which means that they have real effects on the lives of pupils once they have left school. About three-quarters of all pupils take a public examination in at least one subject before leaving school. In England and Wales these public examinations may be drawn from two examination systems, the General Certificate of Education (GCE) and the Certificate of Secondary Education (CSE). In Scotland, which has a separate education system, there is much greater homogeneity, with almost all pupils who present doing so for the Scottish Certificate of Education (SCE), although a small number also present for examinations offered by English GCE or CSE examination boards.

In the near future this structure of public examinations will be replaced by new systems. In Scotland the Standard Grade will provide a three-tier system of foundation, general, and credit level examinations, while in England and Wales the current CSE and GCE examinations will be replaced by the General Certificate of Secondary Education (GCSE) examination. The essential point is that public examinations will continue to provide a highly visible and widely used framework for selection into post-school educational and occupational careers. Of course, the situation is much more complex than this. The Technical and Vocational Training Initiative (TVEI), and the substantial amount of education/training that is taking place under the aegis of the Youth Training Scheme (YTS) provide but two indications that the teaching of academic, vocational, and life skills, which were previously the sole preserve of schools, cannot be viewed in isolation from other institutions, nor can they be viewed simply in an academic perspective.

Further, the various philosophies of schooling that underlie these education systems give the school a wider mission than that dictated by academic attainment alone. Most individuals would want schools to play a role in the all-round development of young people. This means that the outcomes of schooling have to

be seen in a wider perspective. The recent Hargreaves Report (Hargreaves, 1984) on improving secondary schools listed four domains of pupil achievement that schools should address:

(1) Knowledge acquisition/expression - the capacity to retain propositional knowledge, to select from such knowledge appropriately in response to a specified request, and to do so quickly without reference to sources of information.

(2) Knowledge application/problem solving - the application of knowledge to practical rather than theoretical ends, and in an oral rather than written form.

(3) Personal and social skills - the capacity to communicate with others in face-to-face relationships; the ability to co-operate with others in the interests of the group as well as the individual; initiative, self-reliance, and the ability to work alone without close supervision; and the skills of leadership.

(4) Motivation and commitment - the willingness to accept failure without destructive consequences, the readiness to persevere; the self-confidence to learn in spite of the difficulty of the task.

Although these four domains of pupil achievement may not address all of the objectives that parents, pupils, and other constituencies might have for schooling they provide a basis for assessing the relationship between attainment as measured by pupil performance in public examinations and a wider set of outcomes that schools are striving to achieve. The first domain, knowledge acquisition, is probably quite well reflected in pupils' examination performances. Such examinations are primarily of a written nature, and are undertaken in conditions of strict time limits with the requirement that pupils have little additional

resources available to them. "The examinations emphasize knowledge rather than skill; memorisation more than problem solving or investigational capacities; writing rather than speaking or other forms of communication; speed rather than reflection; individual rather than group achievement." (Ibid, p2). Public examinations also partially assess the second domain of achievement, knowledge application/problem solving, but they do so to a lesser extent than for the previous domain. The assessment of this domain is typically more time consuming and often involves the examination of practical exercises. The third and fourth domains of achievement are not directly assessed by public examinations, although they are indirectly assessed insofar as they interact with attainment in the first two domains. Thus, in assessing the effectiveness of schools on the basis of pupils' performances in public examinations we are at best gaining only a partial picture of the way that schools vary from one another in terms of their outcomes. The tendency to consider that which is measured as the objective of assessments of schools poses the danger of a narrowing of the overall criteria for assessing the effectiveness of schools. It is, therefore, important to emphasize the importance of the link between the curriculum and pupil assessment, and to provide the necessary structures to ensure that it is the former that determines the later, rather than the reverse.

Torrance (1986) raises several issues related to the use of examination performances as a basis for the evaluation of schools. The thrust of his criticism of the use of school examinations is threefold: examination scores are designed to discriminate between pupils, rather than schools; examination scores are unreliable; and school evaluation should link directly with school development. The charge that the information available is less than perfect can be disposed of fairly rapidly. Of course, the measures of examination performance are unlikely to be measured with absolute accuracy. However, this does not mean that they are invalid in this context. Just as the forgoing has indicated that examination marks do not measure all aspects

of pupil attainment, they are probably relatively accurate measures of pupil attainment in the first domain discussed earlier. In fact, the studies that Torrance cites in support of his argument indicate that within Examination Boards the marks awarded are relatively reliable.

Torrance's main caveat lies with attempts to compare or equate marks across Examination Boards, or across time. True, the problems are greater here, and this indicates that studies of school effectiveness need to either control for the Boards at which pupils presented or analyse their data wholly within Board constituencies. Provided the errors in the measurement of attainment are not consistently biased in one direction or the other for individual schools, the estimates of school effectiveness will not be biased by such errors. Since examiners generally do not know which schools their randomly allocated scripts come from, there should be no significant problems for estimating school outcomes, even though the marks for individual pupils are not one hundred percent reliable. However, the extent to which the marks awarded do contain such errors of measurement, the proportion of the overall pupil-level variation in attainment that can be attributed to schools will be reduced.

The thrust of Torrance's other two criticisms are less easily cast aside. First, the argument that examinations are designed to discriminate between individual pupils, and not between schools, has a long history in the school effectiveness literature. It dates back to the early critiques of the seventies[9]. However, the argument carries more force in systems in which there is only a weak articulation between the curriculum and the tests employed to assess pupil performance, such as that typified by the tests employed in the National Assessment of Educational Progress in the United States (NAEP). Indeed, in the construction of these tests any items that are sensitive to school contexts are dropped

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[9] Cuttance (1980) provides references to the literature on this issue.

on the grounds that they would unfairly advantage some pupils and disadvantage others. The situation in Britain is, however, quite different. The syllabus for the public examinations in each subject is sufficiently well understood by subject teachers as to produce a direct link between the knowledge examined in the examinations and the knowledge that teachers are attempting to convey to their pupils. That is, the examinations are *curriculum sensitive,* not perfectly, but probably to quite a high degree. This feature of the examinations would be enhanced further by the introduction of criterion referenced examinations, rather than the present norm referenced examinations. In criterion referenced examination marks are awarded on the basis of some predefined criterion of what constitutes a correct answer, whereas in norm referenced examinations marks are determined by the sagacity of the pupil's answers relative to those of other pupils. Under a criterion referenced system there are no predetermined quotas for the numbers of pupils who may receive passes at each level, they could all, for example, obtain marks of ninety percent, or above,. In a norm referenced system, on the other hand, the examiners usually have some preset proportion whom they will classify as passing the examination, fifty percent, for example. The *Standard Grade* which is being introduced to replace the *Ordinary Grade* examination in Scotland is built within a criterion referenced framework, although it will be of interest to observe how faithfully the marking regime reflects this in practice.

The criticism that examination marks can be of little relevance in the evaluation of schools rests on the mistaken assumption that they should be the sole, or even the main element in any such evaluation. It also raises the issue of whom such evaluations are of and the purpose for which the evaluation is conducted. No single evaluation strategy is likely to be of equal utility for all possible purposes. Thus, it is important to delimit the purposes for which one might wish to assess the variation among schools in terms of their pupils' examination performances. Clearly, school effectiveness studies have a very limited role to play in staff assessment schemes, and probably no

direct role in staff development schemes. Successful school improvement programs in the US have, however, included a substantial role for the assessment and monitoring of outcomes. They have been used to provide information on the academic progress of different types of pupils within individual schools, and feedback on the effectiveness of particular improvement strategies. In this context such assessments are not expected to produce a simple estimate or index of effectiveness, but indications of the effects of particular practices on a range of outcomes. The idea of a single unidimensional index of effectiveness is untenable, because schools are likely to be differentially effective for different types of pupil.

On another level, estimates of the effectiveness of schools provide an indication of whether the variation between schools is important relative to variation between school sectors, grammar and comprehensive, say, and an indication of the magnitude of differences between schools relative to changes in pupil attainment over time. This is important in assessing the priority to be attached to reductions in the disparities in effectiveness between schools relative to efforts to raise the overall level of attainment in the system through the introduction of better teaching methods, environments, and technology. If there are only small disparities in effectiveness between sectors then there may be only small gains to be obtained from attempts to transfer schools from one sector to another. This indicates one of the limitations of studies of schools in an extant system. The variation in the system is constrained by present practices and contexts. It is possible that large scale reorganisation or the introduction of new practices and contexts could have much larger effects than those that would result from a more widespread adoption of the best practices in the current system.

Heyns and Hilton (1982), and Goldberger and Cain (1982) raised the issue of the relevance of the test items to the curriculum taught in high schools in their critiques of the Coleman *et al* study as there does not appear to have been any

attempt to construct tests that were curriculum sensitive. Coleman *et al* rebutted this challenge to the validity of the study by arguing that the "core of skills intended to be learned in all programs in all schools is verbal and mathematical skills. Thus, these tests measure what are generally regarded as the most important cognitive outcomes of schooling" (1982b; 165).

This marks a significant difference in the conceptualisation of the outcomes of schooling in the US and Britain. All of the British studies employ examination results as their primary cognitive outcome measure, although Steedman also considers attainment on a standardised test. The discussion above argues that examination attainment is a curriculum sensitive measure of schooling outcomes, although they measure only certain aspects of pupil attainment. There is also a recognition that their importance in any overall evaluation of school performance must be kept in perspective (Steedman, 1980,1983; Gray, 1981a).

The Coleman *et al* study employed only a subset of eight of the items in each test. This was because they wished to compare attainment between sophomore and senior year, which could be undertaken best with only the items that were common to the tests in both years. Heyns and Hilton (1982) argued that Coleman *et al* would have obtained a more accurate assessment of sector differences if have used the full set of test items. There own analyses indicated that the difference between the private and public schools was greater for a model based on the full test, than for the original study using the shortened test.

Steedman employs a method of analysis that allowed her to treat the outcome measure as a series of ordered categories, but all of the remaining British studies discussed in the previous section employ one or other overall measure of examination attainment, or a school-level proportion based on the number of pupils attaining some arbitrary threshold (for example, two O level equivalent passes). Steedman (1983) discusses several issues in the use of examination results in this context: the relative weighting of each category, aggregation and equivalence

across different examinations, only a proportion of the pupils in a school sit an examination in any given subject, an overall indicator of pupil attainment should take account of both the quality of passes in individual subjects and the quantity of passes, the results obtained from different examination boards may not be directly comparable, examination outcomes are qualification or certification orientated and may not be suited to measuring pupil progress, pupil attainment is confounded with school presentation policies. There has, however, been little challenge to the validity of a range of examination measures as indicators of the outcomes of schooling in studies of variation in performance between sectors.

Variation in sector slopes

Clifford and Heath (1984) suggested that the implications of the differential degree of inequality in the comprehensive and selective sectors in the Gray *et al* study reflected variation in within-sector relationships between attainment and social class. In modelling terms this translates into variation in within-sector slopes between the two sectors. Arguments about the need to allow for within-sector slope variation have also been at the heart of several of the critiques of the Coleman *et al* study of public and private schooling in the US. Coleman *et al* themselves employed a model specification that allowed for variation in slopes between all their background variables and attainment in the two sectors, but not for variation in slopes between schools within each sector. Several of the critiques argued that a model that constrained slopes to be the same in both sectors fit the data as well as the variable slope model (Noell, 1982 Willms, 1985). However, most of them employ a model that allows for within-sector variation in slopes (Alexander and Pallas, 1982, 1985 Heyns and Hilton, 1982; McPartland and McDill, 1982). Among the British studies, McPherson and Willms (1986) present findings based only on a model that constrains sector slopes to be the same across sectors, and Steadman employed a method that

allowed for freedom of variation in the relationship between background and attainment in each sector.

McPartland and McDill (1982) in discussing the Coleman *et al* findings of variation in slopes across sectors indicate that "this result introduces an unusual way of thinking about school effects. It emphasises school effects as an association between variables —the relationship between family background and achievement— where almost all previous research has examined only the direct school effect, such as test score performance."(pp.82) McPartland and McDill were somewhat behind in their reading of the literature, as Burstein and Miller (1980), Cronbach (1976), Keesling and Wiley (1974) others had discussed this issue some years previously. Nevertheless, their raising of the issue in the context of the study of variation in performance between sectors was apposite, as most of the discussion of variable slopes in cognate studies had taken place in the context of research on variation in attainment between classrooms, and between schools. As it turns out, methodological and statistical research on both sides of the Atlantic was at the same time engaged in the development of a model that would formally allow for within-unit slope variation in the evaluation of differences in performance between schools and between sectors (Aitkin and Longford, 1986; Burstein and Gustaffson, 1983; Cuttance, 1983; Goldstein, 1986; Mason, Wong, and Entwistle, 1985; Raudenbush and Bryk, 1986). This development work has given birth to the *multilevel model* which provides a more sophisticated methodological and statistical framework for studying the effectiveness of schooling and variation in performance between sectors. This model will be discussed more fully in chapter 5.

Discussion

This chapter has discussed the major studies of variation in performance between educational sectors and the critiques of their theoretical and methodological frameworks. These studies have been undertaken with a rather different set of objectives to those conducted in the field of school effectiveness research that were reviewed in the previous chapter. The sector evaluation studies have focussed on determining whether one sector is performing better than another, while school effectiveness studies have focussed on attempts to find why there is variation in the performance of schools. In essence, most of the work within one field has ignored that in the other field, despite the potential commonality of interest.

Critiques of sector evaluation studies have focussed on the difficulties of specifying a suitable set of control variables so as to remove the effects of selection processes that channel particular types of pupils toward the various sectors, on the appropriate outcome measure for such studies, and on the desirability of allowing the methodology to provide for the variation in relationships between pupil background characteristics and attainment that characterise the different sectors. Chapter 5 will take up these issues and develop a specification of the multilevel model that meets the statistical and methodological requirements for analysing data on a school system that can be characterised as exhibiting variation in outcomes between both schools and sectors. But, before that, the next chapter derives a typology of sectors that is based on an historical analysis of the development of the Scottish education system.

Chapter 4

The Development of the Scottish Secondary School System

Introduction

This chapter develops five typologies of school sectors based on a historical overview of the development of the Scottish secondary school system. The typologies focus on the stages through which the system was developed from the elementary school system that was established in the last quarter of the nineteenth century into today's secondary school system; the role of the church, in particular, the development of a separate Catholic school system; the selective nature of the school system; the different types of communities that schools serve; and the authorities through which schooling is administered and governed.

The next section provides a brief historical overview of Scottish education since the establishment of a national school system late last century. This is followed by a more detailed account of the main stages that mark the development of the national system from what was initially an elementary school system with no provision for secondary schooling through to todays secondary school system. The development of a separate Catholic school system is then discussed in a separate section that follows this. These two accounts of the development of the system will provide the basis for the analyses of variation in the effectiveness of schools in the Catholic and non-denominational sectors in chapter 10, and of a similar analysis in chapter 11 of schools that were founded during the different phases of the development of the system. Recent research in the United States (Coleman, Hoffer, and Kilgore, 1983) has shown that attainment in the Catholic sector there is higher than the public school sector, and an earlier analysis of data for Scottish schools

suggested that schools founded in the earlier stages of the development of the system may be more effective than those founded more recently (Gray *et al*, 1983).

Other research has also indicated that selective schools may be more effective than non-selective schools (Steedman, 1980; that there is variation in attainment between EAs (Willms, 1987); and there have been suggestions in the literature that attainment may vary with the type of community that a school serves, although there does not appear to to have been any systematic investigation of this proposition. After the sections detailing the development of the Scottish secondary school system, a final section will thus discuss differentiation among schools in relation to possible variation in attainment between sectors based on the selectivity of schools, the EAs through which schools are governed, and the the types of communities that have provided variation in the environments in which Scottish schooling has developed. Variation among schools on these latter dimensions are the subject of analyses presented in chapter 9.

Historical Overview

The 1872 Education Act made schooling compulsory from the age of five until the age of thirteen years. Only a small number of secondary schools were established prior to the turn of the century. The Acts of 1889, 1890 and the Science and Arts Act of 1982, however, provided a substantial stimulus to the establishment of schools providing post-primary instruction, but the first Higher Grade schools were not designated until 1900 (Scotland, 1969). The Munroe Act of 1918 provided for the incorporation of the system of schools which had been established by the Catholic Church , mainly in the West of Scotland, into a reorganised state administered system of schooling. After 1918 the system comprised a mixture of schools all loosely incorporated under the umbrella of the the administrative structure provided by the Scottish Education Department. Many of these schools were highly selective , some

also *fee-paying*, although there were a significant number which served as *omnibus* schools for whole communities, taking all-comers, particularly in rural areas and small towns.

The establishment of government funded schooling in Scotland can be viewed as passing through four distinct stages. The 1872 Education (Scotland) Act established a formal and active role for government in the organisation and funding of public schooling[1], and it introduced compulsory schooling for all children between five and thirteen years of age, unless they were exempted from attendance under specific regulations that were laid down in the Act. This Act established the first stage of the development of a national and public school system which continued until the end of the century, by which time new Acts had been introduced to allow for the use of public funds for secondary schooling.

The 1872 Act had explicitly excluded secondary schooling from its main provision for funding, although it did allow the school boards that it setup to provide secondary schooling funded from other sources. During the first two decades of this century most public post-primary schooling was provided for in two-year *supplementary classes* in primary schools, but there was also a growing post-primary sector, *the higher grade schools*. Enrollments in the Higher Grade schools expanded to about half that of the enrollment of the supplementary classes by the time of the reforms in 1918. The few secondary schools that had been taken over by school boards under the 1872 Act, referred to as the *higher class schools,* subsequently declined in importance and quality , and by 1918 they accounted for an enrollment which was only about half that of the higher grade schools. The 1918 reform marks the begining of the third stage of the development of the system. It redesignated schools offering post-primary education as *secondary schools*, and *advanced divisions* in primary

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[1] Prior to this Government had played a purely regulatory role in the provision of schooling.

schools. The former were to offer three-year or five-year courses of an academic or technical/vocational nature, while the latter were to cater for the less able pupil who it was thought would not benefit from a more advanced education. The 1918 reorganisation was the basis of the junior/senior secondary system that developed in the inter-War years, which continued until the fourth stage of development ushered in by the *comprehensive* reforms which followed Circular 600 in 1965.

As the system developed through these four stages, new schools were established or transformed from the basis of those in existence at the time, however, most schools in existence today had been established in one form or another by the late 1920s. The growth in pupil numbers since then resulted in a substantial expansion in the size of schools, but only a small number of the 470 secondary schools in existence in 1980 have been established since this period.

The establishment of a national system of schooling

It is difficult to avoid noticing the prevalence of worship at the altar of democratic and meritocratic education in most accounts of Scottish social history. Perhaps there is some truth in these views, particularly in comparison with the more elitist systems that developed south of the Border, and on the Continent. However, this characterisation of Scottish education would appear to apply much more to the period between the reformation and the the middle of the nineteenth century, and loses some of its veracity when applied to the period after the intervention of the State in 1872. The formal intervention of the State in establishing a national system of schooling in the last quarter of the nineteenth century initiated a sequence of historical transformations which, through the differentiation of educational institutions, brought about a highly selective system of promotion through the school system. The selective nature of the system was to remain the dominant feature of Scottish education until after the War, when it slowly gave way through a series of

minor reforms and finally crumbled under the pressure for social and educational reforms in the 1950s and 1960s that resulted in the introduction of legislation for a fully comprehensive system of schooling.

Education and social selection

The Scottish education system has been described as a *sponsored mobility* system (McPherson, 1973; Hope, 1984) as opposed to a *contest mobility* system of the sort that exists in the United States (Turner, 1960).

"The governing objective of a contest mobility system is to give elite status to those who earn it, while the goal of sponsored mobility is to make the best use of talents in society by sorting persons into their proper niches." (Turner, 1960, pp857).

Meyer (1972) introduced a related concept of *chartering* to describe such European systems of education. Unlike a few schools in England, no Scottish schools had formal charters bestowed upon them by the realm, but the metaphor may be employed to describe a situation in which

"the effects of [schools] arise less from their internal structures and curricula than from their external settings - the institutional definitions, or charters, of their authority..." (Meyer, 1972, pp109).

The concept of a charter cuts across the distinction between socialisation and allocation because allocation, the outcome of selection, can be a potent means of inducing socialisation (Kerckhoff, 1976). In the case of schooling it homogenises the variation within institutions and permits greater adaptation of practice and goals to the characteristics of pupils who enter them. Barr and Dreeben (1983,1987) have argued that it is essentially through such processes of differentiation and homogenisation that schools have their most powerful influences on learning and pupil attainment. Chartering effects are also

expected to subjectively influence pupil attainment and social orientation through the morale associated with membership of an elite (Hope, 1984). Thus, a sponsorship model of schooling that manifests significant chartering effects should provide the basis for an efficacious and efficient educational system. Hope (1984) suggested that such systems will exhibit little variation in the effectiveness of their chartered schools, and he shows for a cohort of pupils who passed through the school systems of Scotland and the United States in the 1940s that while the effects of the Scottish system were more meritocratic, the US system had significantly more autonomous influence on the later occupational attainment of its students. The total contribution to the educational attainment of students was, however, found to be similar in the two systems.

The differences between the effects of the two systems is supportive of the distinctions drawn by the sponsored versus the contest mobility models of social mobility. Under the contest mobility system in the US the occupational attainment of individuals is the result of "character, effort, initiative, and guile", in addition to ability, and schools have a role in influencing the transmission of these characteristics into both cognitive and affective outcomes. Whereas, under the highly selective system that operated in Scotland at the time, the occupational attainment of individuals was determined more by the sponsorship of selected pupils of high ability to the highest levels of educational attainment, which were then, through continuing sponsorship, translated into high occupational attainment through placements into the appropriate social and occupational positions.

Hope (1984) reported that 47 percent of the total influence of education on occupational attainment was attributable to ability, 10 percent to social class, and 43 percent to the autonomous effects of schools in Scotland, while the parallel figures for the US were, 27 percent for ability, 15 percent for social class, and 57 percent for the autonomous influence of

schools. This finding supports the characterisation of the Scottish system at that time as being more sponsorship orientated and less of a contest system than that in the US.

The development of a differentiated institutional structure of schools

The system of schools that evolved under the national system soon reflected a desire on the part of the Department to differentiate pupils who were capable of benefiting from advanced education from those who would not. This involved the selective sponsorship of a small minority of pupils into educational careers that would take them down the road leading through post-elementary schooling, over a series of further hurdles and barriers, and for the survivors, onto further education in the prestigious universities of the land. As time went on, and more individuals passed the early barriers on the road, the later barriers were periodically raised to maintain the restrictions on the flow of individuals clearing them. This process can usefully be viewed through the metaphor of competition in the athletic arena. The record books of the Modern Olympics show that although more and more athletes have managed to surpass the previous record marks, the number of medals awarded has remained the same in each event, and the only means of advance beyond this position has been through the introduction of new events and competitions. The metaphor can be taken a step further also, the statement that 'it is more important to compete than to win', reflects the ideology of the democratic and meritocratic nature of the competition, but it also enshrines legitimacy in the actions of the arbiters who select the competitors and of the immutability of the rules of the competition. Further, the Olympic charter gives all nations the right of entry to the competition. In Scottish education the claim for the democratic nature of the system is also based on the right

of all 'nations'[2] of society to enter individuals in the competition for entry into post-elementary schooling. This was the traditional basis to the defence of the parochical school system which was viewed as,

"an open-ended continuation of elementary schooling, tailored to the socio-economic circumstances of the parish and pupil, locally available, and free of rigid rules requiring the allocation of pupils to different educational stages, more or less independently of the pupil's ages." (McPherson & Raab, 1987, in press)

This system of schooling was believed to offer

"the right of the clever child from whatever social class he may come, to the highest and best education the country has to offer." (McClelland, 1935; p272)

The faith in the efficacy of this system was supported by the opportunity that it allegedly provided for the capable, ambitious, and persevering boy, the *lad 'o pairts* to reach the zenith of the education system. Although, it appears that few lads 'o pairts who were able to avail themselves of the opportunity of an academic career which might have promoted them to a new life beyond the grinding poverty and hardship of life in the small towns and burghs.

"The Scottish dominee could usually count himself lucky to find one or two lads with that narrow and specific set of academic talents during the course of his teaching career" (Paterson, 1983, pp199).

"The majority of those who went to university from a parish school were not poor boys but the sons of the rural middle-class.

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[2] A medieval use of this term is 'a body of students belonging to a particular district, country, or group of countries', in which sense it is still employed in the Universities of Glasgow and Aberdeen, in connection of the election of the rector.

Only rarely did the schoolmaster have the chance to advance the son of a labourer or ploughman." (Anderson, 1983, pp124).

This view of the education system prevailed until the State became formally involved in the provision of schooling in the late nineteenth century, when it took over responsibility for establishing a national system based on the system of parish schools. The introduction of *specific subjects* for study, and of the qualifying examinations for entry to post-elementary schooling before the end of the century, however, marked a departure from the open-ended nature of the path from elementary schooling through to higher education that characterised the former parish system. Such advancement was to be made conditional upon the attainment of a particular standard of knowledge and learning in the *elements* . Thus, the barriers to entry to post-elementary education had been formally put in place.

The erection of this barrier implied a division of the population of pupils, and with it a differentiation in the types of education and of institutions for its provision, that were appropriate to those on either side of the barrier. Although the state had taken over a small number of the secondary schools run by the Burgh and Town Councils, known as the Higher Class schools, the 1872 Act explicitly excluded the funding of secondary schooling from state resources. As a consequence, the quality of education offered in these schools deteriorated, and they were subsequently thought not to be the appropriate institutions in which to vest the responsibility for the provision of secondary schooling.

Instead, the elementary schools were extended to provide for two years of post-elementary schooling in what were called the higher grades. The provision of such classes was allowed in only those elementary schools deemed to be of sufficient quality, and it lead to a re-classification of schools offering this form of education, which were referred to as the Higher Grade schools. The number of Higher Grade schools increased from 27 in 1900, to

191 in 1910 (Wade, 1939), at which level it remained until after the reorganisation of the early 1920s. By 1920 there were about 30,000 pupils in these Higher Grade schools, 15,000 in the Higher Class schools, and 60,000 in supplementary courses that had been developed to cope with the increase in numbers of pupils in post-elementary education subsequent to the raising of the leaving age to 14 years in 1901.

A significant number of schools had stayed outside of the national system at its foundation in 1872. These were principally the Catholic schools, and the Independent schools, both of which had evolved separately to the earlier parochial school system. The Catholic schools had not joined the national system because they wished to safeguard the teaching of their own catechism, while the Independent schools represented a separate tradition that arose from the post-reformation development of the Burgh and Town school system. Many of these schools provided an opportunity for their pupils to study secondary subjects and the classics, in addition to teaching the basic elementary curriculum. Some of them had been setup specifically with the aim of teaching the (Latin) Grammar (Law, 1965), while others had been established during the eighteenth and nineteenth centuries as Academies to teach the new subjects of science and the modern languages. Other schools that remained outside the national system included those of the Episcopalian church, and those which emerged from the Endowed Schools Reform Acts of 1869,1878, and 1882. There were some 66 Episcopalian church schools in 1905, but only 49 in receipt of government grants in 1918. The 47 schools that emerged from the Endowed Schools Reform Acts had dwindled to 13 by the 1920s, with most of the loss joining the national system (Scotland, 1969, p71). The Catholic schools finally joined the national system as part of the reforms ensuing from the 1918 Education Act.

The 1918 Education Act and the Codes of 1920-24 established a more differentiated structure between the

elementary stages and the secondary stages of schooling, although the institution of secondary schooling as a stage appropriate for all pupils was not to be formally recognised until after the passage of the 1945 Education Act. Under the Secondary Codes of the early 1920s, the Higher Class and Higher Grade schools, plus the few transferred Catholic schools that qualified for secondary status, were redesignated as secondary schools, and the elementary schools that had been offering supplementary classes were redesignated as Advanced Division schools, but retained under the Day Schools Code. The secondary Code of 1920 regraded all Higher Class and Higher Grade schools that were offering a five-year or longer course as secondary institutions, and the Code of 1923 regraded the remaining schools of these types as three-year (short course) secondary schools. The Advanced Division primary schools were often separated from the elementary parts of those schools and in many cases towns and cities established central sites for Advanced Division schools that received pupils from several elementary schools. Thus, at the time of the formal establishment of the secondary school system in the public sector there was a three-way division of institutions between Advanced Divisions that offered a two-year post-elementary course, a junior secondary school sector, although it was never officially classified as such, which offered three-year courses of a practical or vocational nature, and some five-year courses, plus a senior secondary sector which offered five year courses intended for those pupils who were destined for post-secondary education in the universities or a career in the professions.

This structure of schools remained the backbone of the Scottish education system for most of the next five decades, although its erosion set in after the war when the age of compulsory schooling was raised to 15 years in the 1947 Education Act. In the thirties the numbers of pupils in the Advanced Divisions was about the same as that in the combined secondary sectors, although the numbers of pupils in total had risen by about a quarter in the period 1924-34. There were

official pressures to reduce the flow of pupils who were getting through into the secondary system, and the SED considered that too many pupils were opting for the secondary route without a reasonable chance of completing the three-year and five-year course courses offered in those sectors. The appeal of the Advanced Divisions with their inferior social and educational status and their vocationally oriented courses proved increasingly difficult to maintain. As time passed this stigmatised status was also passed on to the three-year courses offered in the junior secondary schools.

The distinction between the three types of post-primary schooling and the prevailing qualification rates in each were further undermined by local forces, particularly in the less populous areas which fostered the emergence of the *omnibus* secondary school, which can be viewed as the re-emergence of the old parish school at the secondary level. The proponents of psychological testing also emerged during this period and they argued that a larger fraction of the cohort of pupils could reasonably be expected to benefit from a more challenging secondary school course. Some of the Local Authorities in the more populous areas organised their Advanced Divisions as central intermediate schools separate from their primary schools, but longer term influences on the organisation of schooling were to come from the strategies adopted by some of the less urban authorities who incorporated their Advanced Divisions as a separate stream within their junior secondary schools, and from others who fully integrated their Advanced Division pupils into the predominantly three-year course structure of their omnibus secondary schools. These integrated omnibus schools mark a significant departure from the differentiation that existed elsewhere in the system, and they provided a potential for a different relationship between merit and educational attainment.

Many schools in the Independent sector were experiencing financial hardship during this period and joined the national

system. Others charged substantial fees and recruited only from the upper echelons of the social structure, which reinforced the institutional differentiation and the sponsorship nature of the system.

Just before war broke out the 1939 Education Act brought all post-elementary schooling under the one Code, thus providing for equality of funding for the Advanced Division schools with schools offering three-year courses. The Act conceded that Advanced Division pupils were receiving a much lower share of resources than those in secondary schools. In the parliamentary debate on the legislation, the Scottish Education Department was asked to produce figures to show the differentials in resource allocation to the two sectors. Their figures indicate that the per capita expenditure in the Advanced Division sector was little more than half that in the secondary sector, and that the classes were on average a quarter larger in the former sector (Paterson, 1983, pp211). The Act effectively resulted in the effective redesignation of Advanced Division schools as three-year secondary schools and provided them with funding that was on an equal footing with the five-year secondary schools. The Act also provided for the realignment of courses within three-year and five-year schools, but the outbreak of war meant that the implementation of these reforms was stillborn.

The sponsorship model of education was seriously challenged in the 1947 report of the Advisory Council on Education (SED, 1947). This report foreshadowed the major restructuring of the system that was to take place under the comprehensive reorganisation of the 1960s and 1970s. It argued that secondary schooling was a right for all, and that differentiation within the system should not be between institutions but rather between types of courses. It suggested the establishment of a system of schools of equal status based on the omnibus schools that had emerged before and during the war years. The courses would be differentiated to suit the potential of different types of pupil. The report argued that such a system of schools was educational

superior, although it might be more expensive to support. It was clear that the Council considered that the additional cost of the duplication of resources in a system of schools of equal status was an acceptable price to pay for a system that "[is] the natural way for a democracy to order.... post-primary schooling in a given area; that it escapes many of the disadvantages attached to other forms of organisation [they were referring to the junior/senior secondary system]; that it vitiates, though it does not wholly solve, the vexatious problem of selection and grading; and better than any other plan, it promotes the success of the school as a community" (SED, 1947, para 164). Other than the objections of the additional cost burden of such a system, the only significant reservation that the report expressed was one relating to the breadth of the curriculum that could be offered in the upper years of the smaller omnibus schools. Presumably, they were unaware of the substantial rise in the birth rates that was taking place at the time of writing the report, as these would have foreshadowed the portending expansion of the education system that was to follow over the next three decades.

The report, however, exhibits a failure of nerve on the part of the Council, as its main recommendations were for a continuance of the junior/senior secondary system that was in existence at the time. It appeared to accept the argument that this system had not had time to prove its worth. In order to remedy the catalogue of faults in the extant system the report recommended specific ways to make it more effective. These recommendations implied fundamental weaknesses at the core of the system and appear to have been made with little faith that they would remedy the situation.

"[I]n the minds of most Scottish parents the junior secondary was a school for failures, denied the double language course which was the key to higher education and condemned, literally to hew wood if not to draw water." (Scotland, 1969, pp 211).

Although some local authorities acted on the Report's recommendations, the existing structure of differentiation

between junior and senior secondary schools was to largely remain in existence until the advent of comprehensive reorganisation in the 1960s.

"[T]he junior secondary school was left alone to work out its own salvation, which might legitimately vary from one authority to another. What did remain until the sixties was a division into five-year sheep and three-year goats. Even professional training was separate - a special certificate for secondary, a primary certificate with endorsement for work in the advanced division." (Scotland, 1969, pp74)

By this time the secondary school system had expanded in size considerably. . This was due to a combination of the raising of the school leaving age to 14 years in 1945, the increase in the birth rate after the war, and to an increasing tendency for pupils to stay-on after finishing their compulsory schooling. During the period of expansion the total number of secondary schools in the system fell from about 900 in 1947 to fewer than 700 when Circular 600 announced comprehensive reorganisation in 1965. Of the 900 or so schools in existence in 1947 only about 200 were selective senior secondaries offering six-year courses, and in 1965 some 376 of the 668 public secondary schools were selective, with a further 158 partially selective (Scotland, 1969). The substantial expansion in the number of pupils in the system gave local authorities the opportunity to restructure their schools. Many new schools were built to accommodate centres of increasing population. The decline in the number of schools resulted from closures in areas losing population, and the amalgamation of schools to form larger units. Many of the new schools built were established as omnibus schools along the lines of todays comprehensive schools. For example, most of the new schools built in Glasgow in the 1950s and early sixties were of this type.

Comprehensive reorganisation

The announcement of comprehensive reorganisation sounded the death knell for the institutionally differentiated structure of secondary schooling that had characterised the first century of public schooling in Scotland. The system of sponsorship was pursued through the placement of individuals in particular institutions, and the exclusion of others. Formerly this had been undertaken on the basis of 'qualifying' examinations for graduation from elementary school, but with the raising of the school leaving age to 14 years and the recognition that all pupils had a right to secondary education in the late forties another means of selecting the sponsored minority had to be found. The technical achievements of psychological testing in the 1930s manifest in the work of Professor Godfrey Thompson at Edinburgh University and Professor McClelland at St Andrews University were soon called upon to "help place individual children in each category" (Scotland, 1969, 209). The schemes for promotion to secondary school in the period 1945-1965 were based on their work.

In response to Circular 600 some local authorities proposed schemes that included the retention of selective schools or a two tier system, but all authorities were in the end persuaded to adopt a system of all-through six-year schools with the abolition of selection at 12 years (McPherson & Raab, in press, ch 16). The schools were to have fixed territorial catchments and to admit all pupils from within that catchment.

By 1971 forty percent of Scottish EA secondary schools were all-through six-year comprehensive schools, and a further fifth had comprehensive intakes but transferred some or all of their certificate pupils to other schools, usually after second or fourth year. By 1974, 98 percent of all pupils in EA schools attended such schools, with only 3 percent of all secondary pupils attending Grant Aided or Independent schools (Gray, *et al*, 1983, pp231). The pace of implementation of the comprehensive reforms, however, varied among authorities.

The Development of Catholic schooling

Historical Background

The persecution of Catholics and the destruction of Church property during the protestant Reformation of the sixteenth century severely depleted the congregation of the Catholic church throughout Scotland. During the following century various Acts of parliament proscribed the role of the Catholic Church, and in particular, prohibited the formation of Religious Orders and members of the Church from establishing schools. Although the enforcement of these statutes was never pursued with much vigour, they inhibited the establishment of a Catholic parish school system to parallel the parochical school system of the Protestant church established with the assistance of various Acts of parliament during the seventeenth and eighteenth centuries.

At the turn of the nineteenth century the Catholic population of Scotland was located in the North East, the Highlands, and in the South West and was estimated to be about thirty thousand in number (Darragh, 1953). During the first half of the century their number increased to about 150,000 and to about 450,000 by the turn of the present century. This regeneration of the Catholic population resulted from the substantial migration of Catholics from Ireland following the failure of the potato crop during several seasons in the 1840s, culminating in the Irish famine of 1847. Between 1841-51 the population of Ireland fell from 8.2 million to 6.6 million, with an estimated 1.5 million perishing from famine, and 1 million migrating, after allowing for natural increase. The migrants from Ireland left principally for Scotland and the United States, with smaller numbers immigrating to England, and the British colonies of the day. While the poorest members of the Irish population were the worst affected by the

famine, the social and economic position of those migrating varied, with some being able to afford passages to the United States for the whole family, while others were able to muster the resources for only one family member to leave Ireland. This differential in the social and economic position of immigrating families was reflected in the composition of the immigrants arriving at different destinations. The immigrants to the United States tended to be better off than those who left for Scotland, the cheapest passage. Further, the Scottish immigrant population came predominantly from the Gaelic speaking North and West, where the land tended to be poor.

The Irish immigration added to the concentration of the Scottish Catholic population in the south west of the country that had resulted from the Highland clearances of the 1770s. By the early 1920s two thirds of the Catholic community of Scotland resided in the south west, with the metropolitan province of Glasgow accounting for ninety percent of this population. The concentration of Catholics provided the basis for the establishment of a separate community bound together by common ties of blood, origin, and faith.

The first 100 years of Catholic schooling

The basis of a systematic attempt to establish Catholic schooling can be located in the second decade of the nineteenth century when it became evident that the statutes relating to the suppression of these activities by Catholics were not actively enforced, and by the arrival of a few female members of the religious teaching orders[4] who had come up from England. By the middle of the century still less than one third of all Catholic children received any education at all.[5] A survey of Scottish

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[4] Female Religious Orders were not prohibited under the various statutes (Dealey, 1945).

[5] Argyll Commission Report, 1867.

schools conducted in 1838[6] indicated fourteen Catholic schools, and the Argyll Commission of 1867 reported only sixteen elementary schools, with a total enrollment of 2,604, and three Higher Class schools, with a total enrollment of 186 pupils, offering post-elementary education. At the time that the national education system was formally established in 1872 the number of Catholic schools that were under inspection by government officials had increased to sixty-one (Dealy, 1945). The four Catholic schools which were at that time offering post-elementary education had been established in the 1850s and 1860s by the religious teaching orders that had come to Scotland from England, Ireland, and France.

The funding of Catholic schooling in the period before the establishment of the national school system in 1872 was provided from a mixture of fees paid by pupils,[8] government grants, and directly from funds from Church sources. The Privy Council of 1834 introduced grants for voluntary schools, and the Education Act of 1847 extended this provision. However, the schools had to satisfy certain conditions regarding the standards of their instruction and curriculum before being eligible. There were also additional conditions, which combined with the reluctance of the Catholic schools to accept government funds resulted in these schools receiving considerably less funds per pupil than other voluntary schools. In particular, the restrictions that schools in receipt of grants could not use their buildings for the dual purposes of Church and educational activities, and the requirement that they be debt free, curtailed the supply of grants to Catholic schools. The very poverty of the funds available to the Catholic schools and the straitened financial circumstances of the Church forced then to use their buildings economically, and dual use was the norm.

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[6]Reported in Dealy (1945, fn 3, pp124). Her reference is to a House of Commons Report of 1841.

[8] Fees were usually very low, 1p per week for parents who could afford them (Dealy, 1945, fn 21, pp127).

The 1872 Education Act that founded the national education system did not make provision for the funding of buildings for schools that remained outwith that system, and it introduced a rate to be levied by the school boards established to administer and organize the schools in the national system. The rates were levied on all property, and voluntary schools were not exempt. Thus, Catholics as members of the general population were to shoulder an additional burden, and their schools were faced with additional direct costs.

The 1872 Act provided for a national system of elementary schools which within a couple of decades was to be free.[9] The Act made schooling compulsory from the age of five to thirteen years, although exemption could be gained after the age of ten years, provided the pupil could satisfy certain minimal standards of proficiency in reading, writing, and arithmetic.

The Catholic schools opted to remain outside this national system. The bishops and clergy feared that the schools would lose their denominational character, and that the state school system was essentially a Trojan Horse for the interests of the Protestant church. The Act made provision for religious instruction, provided it was kept separate from secular subjects, and provided a conscience clause for parents who wished their children to be exempted from such. The elected school boards were to be responsible for deciding on what form the religious instruction in schools should take. In most areas the school boards opted to provided religious instruction based on the shorter catechism, although in some areas in the Highlands where there was a Catholic majority on the board the longer catechism was chosen. Also, provision was made for two schools to be retained as Catholic schools in Glasgow. The Act, however, made no provision for compensating voluntary schools for any buildings that might be transferred to the national system.

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[9]The Education Act of 1889 abolished school fees.

The strains encountered during the first half century after the establishment of the national system were particularly acute in the Catholic sector because the expansion of demand consequent upon new statutory provisions, and of progress in the state sector, created a disproportionate demand on the upper stages of schooling. The economic demands arising out of the need to provide more accommodation were paralleled by the hardships faced by parents from the retention of children in school for longer periods as the attendance laws were enforced more stringently, and the statutory requirements to provide post-elementary schooling for an increasing proportion of the age cohort.

During the period 1872-1918 several attempts were made to negotiate a basis on which the Catholic schools could enter the national system. Although many in the Catholic church were against such a move, save under the conditions of government funding for an autonomously administered and organised subsystem of Catholic schools, the economic strain impelled others to seek an accommodating settlement with the government which would safeguard the denominational character of the schools in lieu of relinquishing control over instruction and the provision of accommodation. In 1911 the Glasgow Catholic hierarchy offered to transfer schools to the boards provided the distinctive religious character of the schools was maintained through the appointment of appropriate teachers, and in 1916 attempts were made to reach agreement along similar lines on a local basis in Edinburgh. These efforts came to little in the short term, but in 1918 Sir Hector Munro, the Secretary of State for Scotland, introduced a bill to bring the Catholic and other remaining voluntary schools into the national system. Although there was much opposition from both the Protestant and the Catholic population to the bill as published, a revised bill was passed.

The bill provided for compensation for schools transferred to newly created Ad Hoc Authorities[10], provision for religious instruction as of use and wont by the former managers of the schools, and the right of Catholic authorities to approve teachers on religious grounds. In lieu of these concessions the Catholic church conceded authority over the academic qualifications of teachers, and access to the schools by pupils of all denominations. The Munro Act did not directly provide for future schools to become part of the national system, but provision for this was established by the courts when in 1928 the Church won a legal case on appeal to the House of Lords.[11]

The Catholic schools come into the national system

The Munro Act promised remission from the relentless financial burdens that had beset the Catholic sector for the previous half century, however, the experience of the Catholic schools in the next phase of the development of the national system was also marked by severe difficulties. The underdeveloped state of the Catholic sector in comparison with the state sector that it joined necessitated a strong emphasis on the expansion of provision, particularly on the post-elementary sector. Because the Catholic church wanted to maintain the denominational character of the schools they wished to have Catholic teachers appointed to all posts. However, the low rate of graduation from Catholic schools in the previous decades meant that the supply of teachers, who now had to pass a more stringent qualifying examination, was considerably in deficit relative to requirements. The expanding curriculum of the post-

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10 An Ad Hoc Authority was to be established for each of the 33 counties and for each of the five major cities, to replace the 987 School Boards that had been set up by the 1872 Act.

11 This is known as the Bonnybridge case. See 'Action against Sterling Education Authority', *Scottish Educational Journal*, 11, pp 108, February 3, 1928; 'Bonneybridge R. C. School' ibid., 11 pp 329, March 23, 1928; Dealy, 1945, pp 299, for details.

elementary sector exacerbated this problem of teacher supply as it required teachers who could instruct in technical and practical subjects, in addition to those qualified in the classical subjects.. Attempts were made to recruit teachers from Ireland, and some non-Catholic[12] teachers were recruited to Catholic schools, but the brunt of the demands were met by increased reliance on members of the religious teaching orders. Two new Catholic teacher training colleges were opened in the 1920s and by the mid-thirties the supply of teachers was sufficient to meet the demand.

Even though the Munroe Act was seen by many in the Protestant church as being overly generous and conceding too many of the Catholic demands, Catholics themselves were still mistrustful of the secular intentions of the school boards that administered schools under the national system. Some of the Catholic dioceses decided on a path of leasing their schools to the Ad Hoc Authorities, a path that lead to a continuing financial burden of providing new schools when and where required. However, by the late 1920s the Catholic authorities had decided to reverse this decision and embarked on a policy of selling their schools to the boards (Treble, 1972).. In some of the more outlying areas where the demand for a Catholic school was not strong the Ad Hoc Authorities opted to continue leasing the school buildings, but in most areas they accepted the offer to acquire the Catholic school buildings.

The reorganisation of local government on 1929 resulted in the responsibilities of the Ad Hoc Authorities being subsumed under newly created Educational Committees within the County and City Councils. These committees were to consist of a majority of Council members, plus co-opted members. At least two representatives of the Presbyterian church, and at least one

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12 However, only 50 non-catholic teachers were appointed to Advanced Division schools in Glasgow before the Second World war. The Catholic Church also preferred to appoint protestant teachers, rather than non-believers.

from each of the Catholic and Episcopalian churches were to be co-opted to these committees..

Although the structure of education in the inter-War years was set by the reorganisation in the early twenties that resulted in a bipartite post-elementary system; advanced divisions within the elementary sector, and three and five year schools in the secondary sector, it was not until the 1945 Education Act that secondary schooling was established as a stage of education that should be open to all pupils. This, along with the raising of the school leaving age to 15 years in 1947 placed new demands on the provision of accommodation and the supply of teachers in the post-war period. The Catholic schools had more or less bridged the gap that existed upon their entry into the national system before the war, and these new demands were experienced more equally than previously across all sectors of the school system. However, the disproportionate concentration of Catholics in urban areas of multiple deprivation meant that schools in those areas were affected to a greater extent than those in more advantaged areas. A shortage of building materials in the early post-war years also added to the problems of providing adequate school accommodation in these areas. Each new development that raised the retention rate of pupils in schools, or raised the leaving age, imposed greater demands on the Catholic schools as it resulted in a proportionately greater increase in their enrollments in the later years of schooling. Thus, the pressure on the supply of teachers for Catholic schools continued to result in less favourable teaching conditions relative to those in the rest of the state system. The Catholic church wished to see as many teachers of its own faith as possible appointed to fill vacancies in its schools, and throughout the 1940s and 1950s many Catholic schools operated with larger shortages than those experienced by other schools in the system. During this period up to 20 percent of posts were unfilled in some Catholic schools (Treble, 1972). The raising of the leaving age to sixteen years in the early 1960s was to cause a continuation of this situation of greater relative hardship in the Catholic schools, although by this time the

numbers of non-catholic teachers in Catholic schools had risen substantially and more were appointed to meet this new shortage.

The introduction of Circular 600 heralding a change to a comprehensive school system caused relatively fewer problems than former policy changes for Catholic schools as a significant number of them came within the auspices of the Glasgow Authority, which had established a policy of developing a system of comprehensive schools a decade or so earlier. Further, the pace of the implementation of comprehensive schooling under Circular 600 was allowed to vary among authorities, thus reducing the severity of pressures on the provision of buildings and on teacher supply. In some areas, such as Aberdeen, the Catholic schools were closed and their pupils were transferred to newly established non-denominational comprehensive schools. In other areas small selective Catholic junior high schools continued in place, or served as split-site annexes during a lengthy transition period.

Differentiation within the system of schools existing in the mid-1970s

This section discusses differentiation among the types of schools that existed in the system that existed in the mod-1970s when the pupils to which the present data relate were in the schools. As indicated earlier, three typologies of the system of schools at that time are discussed: the first based on the selectivity among schools in the system, a second based on the type of community that schools served, and the third based on the EAs that administered schooling.

The selectivity of schools in the system

As indicated in the discussion above of the development of the Scottish school system, public schooling in Scotland has since its inception been marked by a highly differentiated

institutional structure , which has relied upon various selection mechanisms to restrict pupil intakes to those holding particular *qualifications*. These qualifications have usually been interpreted as indicators of attainment, and the system has often been described as meritocratic, since it selected its pupils on the basis of ability as embodied in attainment, rather than other distinguishing social marks, such as social class and heritage. Consequent upon Circular 600 in 1965 there was a shift away from this selective model of schooling to one based on a system of *comprehensive* schools. In some respects the re-establishment of a system with relatively little institutional differentiation marks a return to a system that harks back to a time before the state formally established its dominance in the governance and control of schooling, that of the Parish school system of the early to mid-19th century.

The principal objectives of the 1965 reforms were social rather than educational; and the arguments for and against a reform along these lines had been canvassed in an official report some twenty-five years previously (SED, 1947). At that time,however, the educational arguments that a selective system was the most efficient way of fostering the talent of the nation held sway.

The system as it stood in the early 1960s consisted of a wide range of different types of institutions, some highly selective, others almost fully comprehensive, some fee-paying, and some of course having to take which ever pupils the selective system rejected as unfit for an advanced secondary education. This selectivity existed both within the public sector, which accounted for 96 percent of all secondary school pupils, and in the independent sector which contained the remaining 4 percent

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[13] The UK Labour Party adopted the comprehensive reorganisation of schooling as party policy as early as 1951, but they were not to gain the reigns of power until 1964. See McPherson and Raab (1987) for a discussion of the political and policy issues related to the introduction of the reforms in Scotland.

of pupils. Most of the selectivity in the public sector was contained within the remaining parts of the junior/senior secondary school system that had evolved in the inter-War period.

Within the public sector there were also a number of selective *fee-paying* schools which consisted principally of the remnants of the higher class schools that had been taken over from the Town and Burgh[14] Councils subsequent to the 1872 Act. There were also a small number of semi-independent fee-paying schools in what was referred to as the *grant-aided* sector, which were in receipt of government grants. These were mainly the old Burgh schools that had continued to remain outside the public system, plus another set of schools which had emerged from the Endowed Hospitals Reform Acts of late last century that catered for less than two percent of pupils in the system. Under the terms of the comprehensive reforms the fee-paying and grant-aided schools were given the option of becoming independent of government aid or of formally joining the public system.

After the 1947 report (SED, 1947), which had strongly suggested that a comprehensive system would be the best system to adopt, but which in the end opted to give the junior/senior secondary system further time to prove itself, some Educational Authorities fostered the development of the comprehensive model in the form of omnibus schools. These schools were clearly non-selective, in that they accepted all pupils from a given local area, although their intakes were creamed by any selective schools which also drew on the same catchment for their intake. This type of school had existed for some time in smaller communities where the population was not large enough to support more than one secondary school. Some of these schools also formed part of a rural feeder school system in which pupils would receive their initial secondary education in a rural short-course (three- year) school before transferring to the five-year receiver school in a

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14 The distinction between a burgh and a town derives from the fact that the former is a town which possesses a (royal and ancient) charter.

nearby town for further education. The age of transfer varied between 14 and 16 years, depending on local arrangements.

At the time that the pupils in the 1981 leaver cohort embarked on their secondary schooling in the mid-1970s comprehensive reorganisation had been in process for almost a decade. However, there were still about a dozen schools in the public sector with selective intakes, mainly due to the fact the reforms had been slow to have an impact on the selection of pupils into the public schools which had been the former local authority fee-paying sector, and the grant-aided school sector in the four major cities. In addition, there were 48 Independent schools which were mainly in the cities. Thus, although there were many comprehensive schools in the cities, some of then were still loosing the more able and socially advantaged pupils from their catchments the only partially reformed former selective sector, and to the Independent sector. In many cases the selective schools in the public sector, like their counterparts from whom they creamed the able pupils, were comprehensive in the sense that they accepted all pupils in their territorial catchment, but they were selective in the sense that they also drew a proportion of their intake from the wider cross-section of all nearby school catchments. In the analysis of the performance of schools which had become all-through six-year comprehensives a distinction is drawn between schools which had creamed and those which had uncreamed intakes in the mid-1970s.

Schools serving different communities

In addition to schools in small communities serving a unique type of population, schools in rural areas, and those in the larger Burghs have also served unique purposes in the cultural and social development of Scotland. The post war economic expansion added a new type of community to that which existed previously, the *New Town.* In each case the school has been cast in a unique role it's service to a particular local community. The educational

sectors implied by the foregoing description of the selective nature of the system suggests several instances where the boundaries of the sectors are congruent with geographical differentiation within the system. The geographical gategories invoked in the earlier discussion of the development of the system include the burghs, cities, and rural areas, but a wider ranging typology of the system is required to adequately describe the geography of Scottish schooling.

As indicated earlier the basis of the present day Scottish school system stems from the *parish* and *burgh* school systems that evolved during the seventeenth and eighteenth centuries. The essential difference between these two separate school systems lay in the fact that the former was under the direct aegis of the Church, whereas the latter was in the hands of a range of public authorities such as the Town and Burgh[15] Councils, or under independent control as the vanguard of an independent and private school sector. The parish school system evolved largely in the pre-industrial era, and its principal domain was the smaller burghs and towns away from the large commercial and industrial connurbations of Glasgow , Edinburgh, and Dundee. The church was also active in promoting education in the cities, but here the burgh school system emerged as the dominant system of schooling. Many of the burgh and city schools were originally established as *grammar* schools expressly directed at a secondary education as a preparation for higher studies at the university. The parish school system, on the other hand, was essentially an elementary school system that provided instruction in the rudiments of reading and writing, in addition to its main objective of teaching the catechism. For a very few able lad o

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15 The communities referred to as the large burghs and towns of the nineteenth century are, in the main, todays cities.

pairts,[16] the parish school also provided advanced instruction in the classics as a preparation for the university.

As the industrial revolution rolled forward there was a substantial population drift to the large and expanding cities, and during this period the Church established a stronger presence in the provision of education in the cities also. Thus, by the time that the state took over control of the parish school system in the late nineteenth century, it was, in population terms, substantially a city based system. However, the distinctive community structures of the burghs and large towns have continued to exercise an influence on the shape of schooling in those areas, and beyond. (McPherson, 1983) During the inter-war years these areas evolved a system of 'omnibus' schools, while in the cities a junior/senior secondary system developed. In addition, a system of feeder and receiver schools were developed between rural schools and those in nearby towns and burghs.

In the 1950s and 1960s one of the the main developments in the economic geography of Britain was the establishment of New Towns. These were often established on green-field sites with economic inducements to attract new and modern industries. Their lack of an established community base and their particular economic structure gave these New Towns a social profile which varied considerably from that of any other established form of community (Orlans, 1952; Heraud, 1964). The fact that they were largely built on green-field sites also meant that the design of the schools provided was based on contemporary ideas about the relationship of the school to the community, and about the architecture of schooling.

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16 The able boy, sometimes, but not necessarily, from a poor family, the *lad o pairts,* is a figure of considerable mythical significance in Scottish educational folk lore. As Anderson suggests in a quotation from a headmaster in Aberdeenshire in 1979, however, "The majority of those who went to university from a parish school were not the poor boys but the sons of the rural middle class. ..... Only rarely did the schoolmaster have the chance to advance the son of a labourer or ploughman" (1983, pp124).

In the analysis of variation in the geography of the effectiveness of schooling presented in chapter 9 a set of geographical categories are employed to distinguish among schools in: (1) cities, (2) large burghs, (3) small burghs, (4) new towns, and (5) rural areas.

The governance of schooling

Scottish public schooling was administered from Whitehall under the Scotch Code of 1872 until George Macdonald succeeded John Struthers as Secretary for Scotland. Macdonald's administrative relocation of a significant proportion of the activities of the Scottish Education Department to Edinburgh took place by *fiat*, cementing an earlier move in this direction when Westminster consented to open a branch office in that city earlier in the century. However, the formal establishment of Edinburgh as the central location for the Department did not take place for a further twenty-eight years, although a "somewhat obscure tribute [had been] paid to Scottish sentiment in the Act of 1918, when the title of the Department was altered from 'Scotch' to 'Scottish' " (Scotland,1969,25). The years of English rule were, however, not barren of Scottish input and direction. Henry Craik as the first Secretary for Scotland, and John Struthers who succeeded him, certainly had a substantial, many would say the dominant, impact on the development of public schooling in Scotland in its fledgling decades (McPherson and Raab, 1987).

The 1872 Act created 987 school boards to administer the newly developed public school system. These boards remained in existence until their abolition after the Act of 1918. They had wide powers with respect to school staffing, attendance, and the curriculum. There was, however, significant variation in the size of the school districts that they administered, ranging from areas with a population of less than one hundred to others which had populations in excess of twenty five thousand inhabitants. In 1913 half the population of Scotland lived in the school districts

administered by a mere sixty school boards, out of the total of 972 then in existence.

These boards represent the first and only substantial attempt to involve the local community in the governance of Scottish public schooling. Although their elected membership in the early years was dominated by representatives of the local clergy, professional, and middle-class groups, they also drew their membership from successful trades and farming groups by the time of their abolition under the 1918 Act. The boards had a wide remit which included responsibility for the selection of staff, the enforcement of attendance, and the provision of buildings. However, it was the latter which occupied much of their energies in the early days. The public system had taken over many of the old parish school buildings, but the poor state of many, along with the rapid rise in (compulsory) attendance under the provisions of the 1872 Act, meant that there was a severe shortage of accommodation in the early years. The boards, nevertheless, found time to exercise a considerable influence over matters relating to the curriculum and standards of teaching. The small number of schools under the aegis of many of the boards and the large number of boards, however, did not ensure an efficient system of administration and governance, with large variation across boards in their efficiency and effectiveness (Scotland, 1969).

The Monroe Act of 1918 created a new set of bodies for the governance of schooling, one for each of the counties plus one for each of the five major cities. A decade was to elapse before these thirty-eight Educational Authorities were directly linked to the County and City Councils, even though their territorial jurisdictions were identical. At this time the functions of the Educational Authorities were subsumed under the County and City Councils who established Educational Committees to conduct the business of governing and administering schooling. These committees were often presided over by a Director of Education,

although this not formally made made a statutory obligation until the passage of the 1945 Education Act.

During the early years of the Educational Authorities' existence local school management committees took over some of the duties of the old school boards. However, these committees were often in conflict with the larger and more powerful Educational Authorities, and their remit consisted of not much more than the enforcement of the compulsory attendance regulations. During the 1920s most of them were disbanded.

Since 1945 the administration and governance of Scottish schooling has remained in the hands of the Educational Authorities and the Department. The three main issues in respect of educational administration and governance that exercised the minds of those responsible for deliberations leading to the the Local Government reforms 1975 were: (1) the extent to which LAs should be left free to make their decisions independently of the Department, (2) the importance of regional centres to have access to *local* knowledge, (3) the appropriate size and jurisdiction required on grounds of efficiency, and (4) the need to provide a *centre* of sufficient stature and size to gain the acceptance of local communities (refs). The subsequent reorganisation resulted in nine mainland *regional authorities* and four Island authorities, although almost half of the population are contained in the Strathclyde Regional Authority, which itself is divided into six administrative divisions.

Discussion

This chapter has discussed various aspects of the development of the Scottish secondary school system that provide the basis for analyses which consider the system as a series of overlapping sectors of schooling. The objective of the analysis of the evolution of the system of schools that exist today was to attempt to delineate features of the development of the system that may provide the basis of sectors of schools that

vary in their effectiveness. In this regard five typologies of the secondary system were discussed.

The development of the system has been marked by a series of major shifts in educational policy, which have successively retained more an more of the school age population in the system for a longer duration. Initially the national system catered only for elementary instruction. Although the official leaving age was 13 years from 1872 to 1901, a significant proportion of the pupils attended on an intermittent basis, or were formally granted permission to leave after the age of 10 years. During this period the only provision for secondary schooling was that which existed outside of the national system, either in the small number of Catholic schools or among the established grammar schools and academies in the voluntary sector. Government grants were available for these schools, but the Catholic schools, in particular, were severely under-financed. Most of the voluntary schools offering secondary schooling were funded primarily from private endowments or by the civic authorities.

The Catholic community decided not to join the nation system when it was formed in 1872, and they were to struggle for the next three decades as they attempted to meet the demands imposed on them by the statutes which increasingly reflected a more expansive view of the role of education. Eventually the Catholic community managed to negotiate acceptable terms for joining the national system as it underwent a major reorganisation in the early 1920s.

During the first two decades of this century the national system had established an embryonic secondary school system, and had raised the school leaving age to fourteen years, while at the same time enforcing attendance more effectively. This resulted in a substantial growth in the size of the post-elementary population in schools, and in the reforms of the early 1920s a secondary school system was formally established. This system consisted of a tripartite structure in which a significant proportion of pupils would be denied a secondary education and

retained in an expanded elementary school structure, the Advanced Divisions. Pupils who qualified for entry to secondary schooling were allocated to to a tier of the junior/senior secondary system that was established from the earlier group of schools that provided post-elementary education in the primary schools, or in the secondary schools, most of which were formerly outside the national system. A small group of the civic secondary schools had been brought within the national system in the 1890s and early this century, but they had not prospered because the SED preferred to develop its secondary school system out of the elite elementary schools in the system. When schools were designated as junior or senior schools in the reforms of the 1920s most of these former civic secondary schools were established as senior schools, but in many of them standards had deteriorated from their former levels.

The former grammar schools and academies had been able to maintain their standards and traditions. Some of these were brought within the national system and designated as senior secondaries, where they were able to maintain their unique position by continuing to cater for the same client groups. Thus, in the reforms of the 1920s two separate groups of schools were designated as senior secondaries offering full five year certificate courses. One developing from the elite elementary schools of the expanding national system, and the other having a well established history of secondary education. The schools designated as the junior secondaries, on the other hand, were the second tier of the more successful elementary schools that had developed during the system's fledgling decades. These, along with the schools that were designated as the Advanced Divisions in the elementary school system were to become the junior secondary system that emerged during the period between the two world wars.

In the meantime, the Catholic schools, although they had formally joined the national system, continued to suffer from deficiencies in resources, buildings, and from severe staffing

problems. The staffing problems were a combination of outright shortages and of the higher standards of qualifications demanded of teachers employed in the national system. These problems were to continue into the thirties as continuing expansion and the retention of pupils in school for longer periods placed strains on the provision of post-elementary schooling in the Catholic secondary sector. These pressures were to reappear again in the post-war period when the leaving age was raised first to fifteen years, and later to sixteen years. The problems of staffing and resources were also exacerbated by the higher concentration of Catholic schools in the more socially deprived areas. The levels of attainment in Catholic and non-denominational schools as they existed in the mid-seventies form the basis of the analyses presented in chapter 10.

The junior/senior secondary school system that evolved during the inter-war years was to remain the backbone of the system until the announcement of the comprehensive reforms in the mod-sixties. These reforms retained most of the older senior secondaries in their existing state, or amalgamated some elements of the junior secondary system with them to establish comprehensives. But the schools in the junior secondary system were to undergo the greatest degree of change through amalgamations and closures as a new set of comprehensive schools were established. Schools that were founded during the different stages of the development of the system, and therefore which embody different institutional experiences in their current existence, form the basis of the analyses presented in chapter 11.

The introduction of comprehensive schooling proceeded at different rates in each EA. For example, Glasgow, which had embarked on a policy of establishing all new schools as comprehensives as early as the mod-fifties, reorganised its system relatively quickly. Aberdeen, through the closure of its Catholic schools and the building of new comprehensives was reorganised early also. However, other EAs such as Renfrewshire pursued different policies for different subgroups of schools.

Argyll and Bute still retained most of its feeder/receiver system in the mid-seventies, a decade after the announcement of Circular 600. In addition, several local authority selective schools were still in existence in the mid-seventies, and there remained the fifty or so schools in the Independent sector which had selective intakes.

The schools in the public system in the mid-seventies were thus subject to varying degrees of selectivity. There were the small number of remaining selective EA schools plus the Independent schools that were formally selective. However, the very existence of selective schools meant that many comprehensive schools were subject to informal effects of selection through the creaming off of their more able and more advantaged pupils. In addition there were the remaining feeder/receiver schools in the yet to be fully reformed comprehensive sector. Schools classified according the to degree of selectivity associated with their intakes will form one dimension for the analyses in chapter 9 of sectors which may differ in their attainment.

The two other typologies of variation between schools that will investigated in chapter 9 are based on the type of community that schools serve, and the EAs which administer schools. There has been much discussion in England about variation in performance between EAs and Willms (1987) has shown that there is a basis for believing that there are differences in attainment between EAs in Scotland also. Educational Authorities are one of three structures of governing bodies in which the government has vested the administration of schools since the inception of the national system in 1872. Initially the system was administered by more than 900 locally elected school boards. The number of governing bodies was reduced to thirty-five in the 1920s through the abandonment of the school boards in favour of educational committees with the same jurisdiction as the County and City councils. The present system of EA based administration arose out of the Local Government reforms of the

mid-seventies, with each of the nine regional authorities and the four Island authorities taking over the responsibility for administering schools.

Chapter 5

Methodological Issues in the Analysis of the Effectiveness of Schooling

The analysis of data on schooling is methodologically and statistically complex. This chapter discusses the main methodological and statistical issues which are currently considered to be of importance for research on the effectiveness of schooling.

The first set of issues discussed include research design, the role of statistical modelling, and inference from samples to the population of all schools; and the second address the development of a specific statistical model for the analyses presented in chapters eight to twelve.

General Methodological Issues

This section addresses three methodological issues which have been raised by recent British research on the effectiveness of schooling. It discusses differences in the design of studies, the role of models in this type of research, and issues in generalisation from data on samples of pupils and schools to the population of all schools.

Research design

The design of recent studies of the effectiveness of schools has varied quite widely. Some studies have been initiated primarily as studies of effectiveness and have sought to collect their data in this framework, while other studies have been based on secondary analyses of data originally collected for other purposes. The former type of study is usually based on a random sampling of the processes (interactions) operating within schools

(eg. the Rutter *etal* (1979) study and the ILEA Junior School study), while studies of the latter type usually have to settle for a sampling of individuals who were involved in the interactive processes embodied in the everyday experience of the classroom and school (eg. Willms and Cuttance, 1985). We can characterise the former type of study as one which rich in depth but, because of limited resources, may be restricted in breadth in terms of sampling from the total population of schools, while the reverse often characterises the second type of study. Small scale (in numbers of schools sampled) but intensive designs and large scale but shallower (in terms of sampling of the actual process taking place in schools) designs provide complementary information about the effectiveness of schooling.

A second area in which the design of studies has varied has been with respect to whether the research design is longitudinal or cross-sectional in nature. Studies which are of a longitudinal design can make stronger statements than cross-sectional studies about change over time and about causal structures which may have generated the data. Cross-sectional studies can only describe relationships in the system at a particular point in time and must assume that the system is in a state of equilibrium if they are to generalise to other points in time. Panel studies of schools, which comprise a series of observations on new cross-sections of pupils across time, stand somewhere between one-off cross-sectional studies and longitudinal studies, in that they represent a sparse sampling over time from the process of schooling. Such studies allow for the investigation of change as *trends* in the system over a period of time or, where the system has been relatively stable, they allow for tests of stability over time of the ordering among and distribution of schools on various measures of effectiveness.

Figure 5.1 Heuristic models of schooling outcomes: modelling influences through time

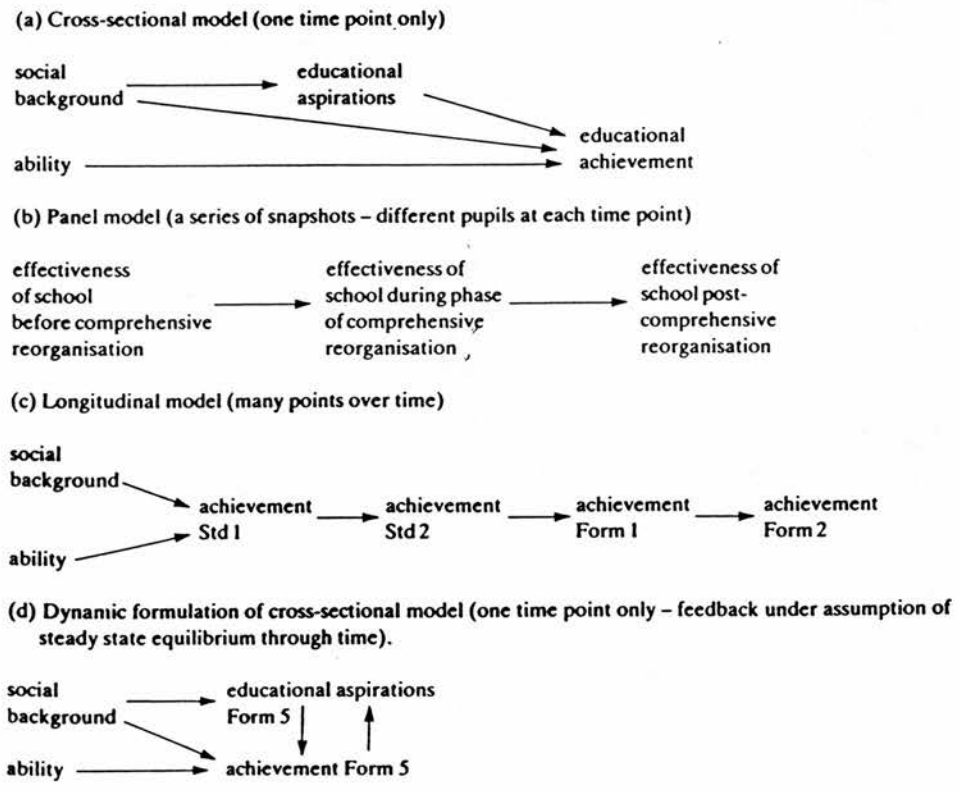
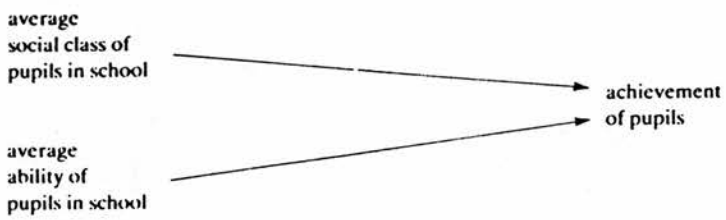


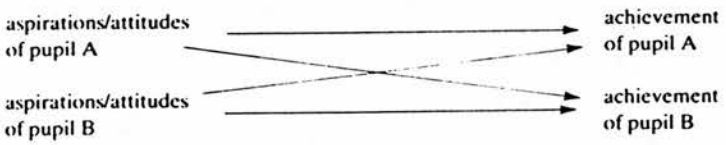
Figure 5.2 Models of the influence of contextual effects in school processes and on outcomes (from Erbring and Young, 1979)

(a) Social telepathy model of direct effects

(i) contextual process specified at a global level

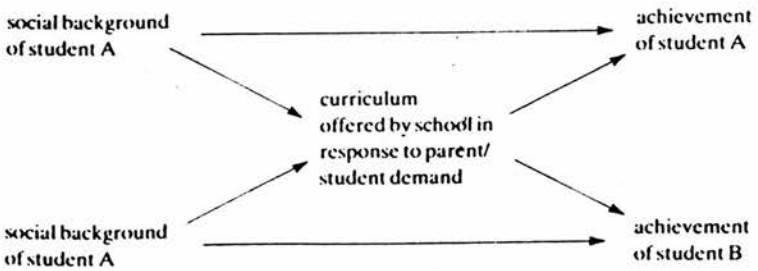


(ii) contextual process specified at individual pupil level



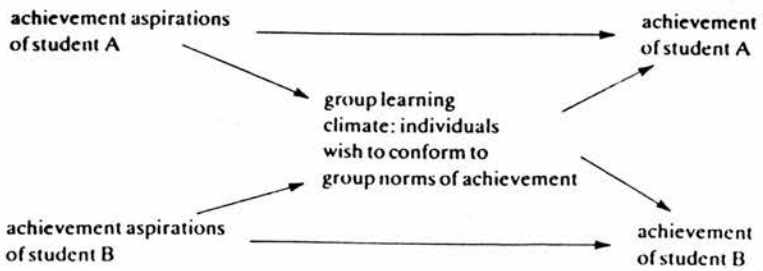
This model posits direct influence of the aspirations of pupil A on the achievement of pupil B. there is no mediating mechanism specified, hence the description 'social telepathy'.

(b) Common fate model of indirect effects



Social background of student A influences type of curriculum offered by school, and this influences achievement outcome of student B.

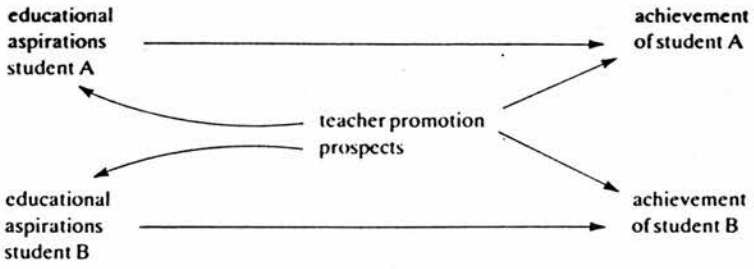
(c) Social norms model of contextual effects



Student aspirations influence group norms to conform and these norms provide a social context which, say, makes it more acceptable for individuals to strive for achievement.

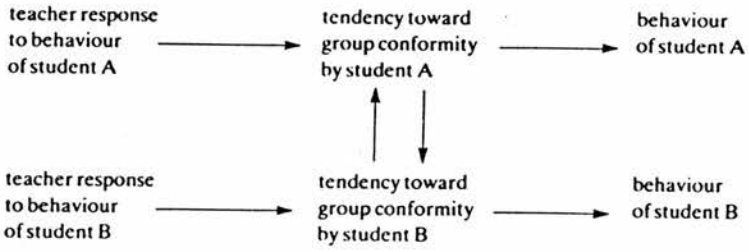
(Fig. 5.2 continued)

(d) Common fate model of spurious effects



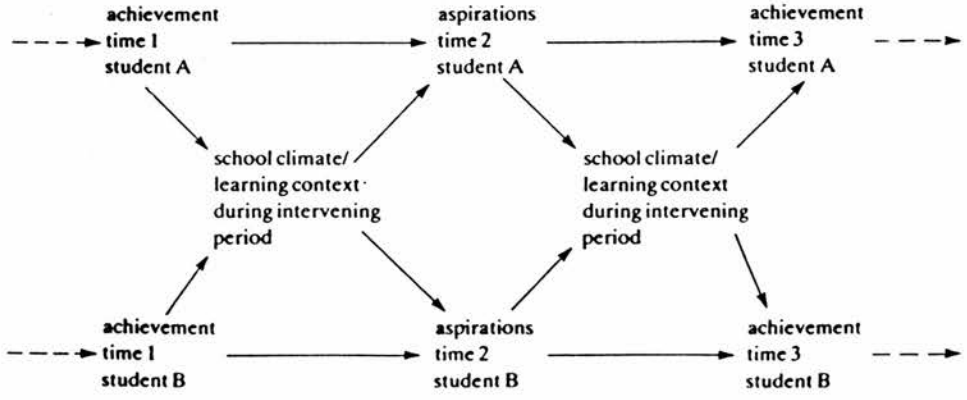
Good schools produce both high student aspirations and good prospects for teacher promotion, but it is incorrect to say that teacher promotion prospects themselves directly influence student achievement. The supposed effects are spuriously attributed to teacher promotion prospects.

(e) Feedback model of influences on student behaviour



This model specifies formally that tendency toward (away from) the group norm by individuals reinforces the behaviour of other students with respect to the group norms also.

Figure 5.3 A longitudinal dynamic model of the influence of attainment and aspirations on each other and of one pupil on another



There is, however, another sense of change which may not be captured in even longitudinal designs: the degree to which the process is dynamic in nature. Cross-sectional designs have to posit an ordering of *variables* in a causal framework if they are to make any explanatory, as opposed to purely descriptive, statements. Longitudinal designs are able to augment these assumptions with information on the ordering of *events* through time. Educational and social interactions at the pupil level produce an ordering among events and provide the information for incorporating dynamic features of school process into the design. Dynamic designs require a more complex form of analysis than that provided by the single equation linear (regression) model. Minimally they require a set of such models in which the treatment of process variables moves sequentially from *dependent* to *independent* as the analysis moves from one event to the next. The interactions of interest at the micro (pupil) level are only captured at the macro (school) level in longitudinal studies if the process is sampled before, during and after the change from one state to the next.

Figure 5.1[1] indicates the differences between designs which are cross-sectional, longitudinal, and dynamic. A specification for cross-sectional designs which capture, but do not separate out the components of the dynamic nature of educational and social processes, is possible through the incorporation of *feedback* effects within the models used for analysis. This is indicated in figure 5.1d and requires the assumption that the system is in a state of relative equilibrium.

Processes in schooling are dynamic in nature, even though there may be periods when the system itself is in a state of little change at the macro level over time. In such situations even cross-sectional data can tell us much about the relationships in the system. Panel designs allow us to incorporate information on

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[1] Figures 5.1, 5.2, and 5.3 are reprinted from Cuttance (1985).

change in the system between specific time points, and longitudinal designs allow for a detailed analysis of the dynamics of individual level processes plus change at the system level over time. The effects of school context will employed to illustrate differences in models based on designs of these three types. Contextual effects, as the name suggests, are those effects of schools which derive from the context in which pupils are taught. The aspects of context which have received most attention in this literature are those to do with the social and ability composition of school intakes. The contexts generated from the social composition of pupils in school intakes are presumed to influence schooling through a variety of mechanisms based on peer cultures, teacher expectations, and educational practices, etc, (Erbring and Young, 1979).[2]

Cross-sectional models may specify these effects in general terms, through variables which are measured as the mean social status and the mean ability of pupils in the school or, by more direct measures of the influences which they are supposed to represent (Alexander *et al*, 1979) as in figure 5.2a. In both cases the contextual effect is specified to have a instantaneous influence on the outcome variable. That is, the context in which individuals are schooled is assumed to directly influence their schooling outcomes. Although these contextual effects are usually posited to operate via intervening constructs such as those shown in figures 5.2b and 5.2c, such constructs are rarely included in the model. This form of cross-sectional model which omits the specification of the process via which the context has its supposed effect led Erbring and Young (op cit) to describe it as a *social telepathy* model. Such naive models risk interpreting spurious contextual effects (figure 5.2d) as real effects, since real and spurious effects are confounded in the estimates obtained from models such as those in figure 5.2a.

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[2] Contextual effects are dealt with more fully in chapter 7.

Panel models may also omit any specification of the actual processes through which contextual effects are supposed to have their influence on outcomes. This is because the *panels* represent cross-sectional snapshots spaced apart in time, usually by a period of years. It is not possible to represent the contextual process as the interaction between variables in one panel and the next because it is not reasonable to assume that the context has been constant between the two time points represented by the panels, and because the pupils in each panel are from different cohorts.

A summary statement of the effects of the contextual process in a cross-sectional model may be modelled by allowing for reciprocal (feedback) effects on the outcome variable between individuals within each context. This means that the process has to be modelled at an intra-context level as shown in figure 5.2e. In this figure the net effects of the context are captured by the feedback effects specified between the intervening outcome for individual A and for individual B. Since these models require a formal specification of the mediating processes by which hypothesised contextual effects influence outcomes, they are able to capture dynamic aspects of the process. To capture the full process, however, such models would have to be specified in such a way as to model both individual's actions within the context and the way these actions change the context itself. The context itself enables and constrains individuals' actions, but can itself also be changed by these actions. This process is dynamic in that individual's actions are both actions in response to the existing context and (re)negotiations toward a new context. By modelling the process with feedback effects at a particular point in time we do not capture the full dynamics of the process, only the net effects of the process at that point in time.

Longitudinal designs allow for the modelling of processes over time, although this has rarely meant the modelling of the dynamics of the process of schooling in the detail suggested above. Intensive longitudinal studies of the schooling process at

the individual level are needed if we are to obtain information on the processes by which pupils develop educationally. The ILEA Junior School project (Mortimore *et al*, 1986), is a welcome step in this direction and the Rutter *et al* (1979) data will provide information on such developmental processes when it is made public. If the design of a study is longitudinal then the dynamics of contextual effects may also be modelled as in figure 5.3. There the outcome of each pupil in period 1 influences the contextual effect in period 2 and both this and the individual's outcome for period 1 influence the outcome in period 2.

Longitudinal studies aimed at modelling processes at the micro level, as in figure 5.3, are required in order to test the relative efficacy of competing hypotheses/theories of the processes operating over time within schools. Until such studies are available it would appear prudent to treat the findings from cross-sectional studies with caution and resist the temptation to make inferences about the dynamic processes which produce the effects found in cross-sectional data. This caveat is all the more important in the present state of the development of research on schooling, which tends to be weak on the specification of theories and hypotheses, hence the statistical models employed in analysing the data are,*ipso facto*, poorly specified.

The role of models

The usual practice of empirical social science research in which the researcher first *explores* the data before building a model to describe the relationships in the data is unsatisfactory. In particular, the methodology of *data snooping* in conjunction with the application of statistical inference about the fit of the model so constructed is logically flawed because it mistakes the nature of and role of statistical inference in empirical research. The specification of statistical models of the effectiveness of schooling involves the translation of the substantive model into a mathematical representation of that model. Further, I argue that

British empirical research on the effectiveness of schooling is seriously hampered by the lack of attempts to replicate findings, and that the restriction of access to data collected by public funds is a focal problem in the accumulation of knowledge.

The ideal translation is one in which there is a one-to-one correspondence between the constructs of the substantive model and those of the mathematical model. That is, the relationships between constructs in the substantive model should be mirrored in the mathematical model. This model specification approach clearly relies on the substantive model as the engine of the analysis. The substantive model may be based on educational theory, the findings of other research, expert's opinions, etc or, as is usual, some amalgam of *common* knowledge and theoretical knowledge. The mathematical model provides a means by which statistical techniques may be employed to assess the possibility that the data may have been generated by the educational structures embodied in the substantive model. The invoking of statistical methods is usually premised on the assumption that the units of observation have been sampled randomly from the population of observations of the type represented by the data. These units of observation are usually *pupils* but, as noted earlier, they could also be discrete *events* sampled from a dynamic process. The methodology which I have outlined so far could be designated as a *confirmatory* or *hypothesis testing* mode of investigation. It assumes that the outcome of the analysis will serve to confirm or reject the substantive model as one which could have generated the observed data. However, evidence for or against a substantive model is not usually interpreted in such a decisive manner. More generally we employ the findings of a current study as evidence which is additional to that gained from other relevant research and from this accumulative process, arrive at an intellectual assessment of a general explanation of how particular educational processes are generated, and of the mechanisms which sustain them.

All of this, however, assumes that we are interested in general explanations of educational phenomena. Often the researcher is interested in the relationships between variables in a particular instance of the general, eg. for a particular set of schools, or an evaluation of the effects of particular educational practices and policies in a specific setting. In this situation the confirmatory mode of analysis may be applied to a sample of observations from the population, given that there are clear questions to be answered, but the researcher may be aiming to do no more than describe or enumerate the relationships in the data. In this situation the methodology applied is one in which the data are explored for evidence relating to some set of unspecified hypotheses that might explain the educational processes that have been observed. The danger in this approach is that it may fall prey to a form of solipsism which exploits *chance* relationships exhibited in the particular sample drawn for the study; all the more so if evidence is garnered selectively in favour of particular substantive interpretations of the data. Hence the description of data may become idiosyncratic and divorced from the body of knowledge which has accumulated from past research. It is for this reason that the replication of studies is of paramount importance to the knowledge accumulation process.

A further problem with strategies based primarily on exploratory analyses of data is the complexity of relationships in the real world. As Macdonald (1983) points out, the underlying structural relationships of interest are not of a *simple* type and thus it is not easy to see them in the data. "What we observe (and base our intuitions upon) are the simple quantities, and it is precisely because these do not of themselves reveal their structure that we have recourse to elaborated models and data analysis" (Macdonald, 1983: p268). This emphasises the fundamental objective of modelling: its purpose is to provide an account of the *real* generative mechanisms which give rise to the *actual* events observed. Thus, the attraction of elaborated

(structural) models and confirmatory methods lies in their power to allow us to go beyond the intuitions and purely empirical accounts provided by exploratory methods of data analysis.

Tests of statistical significance, in their standard usage, tell us whether, assuming our sample is randomly drawn from the population, the statistic (say, an estimate of a mean or correlation coefficient) is different from zero in the population. In a large number of repeated random samples from the population the coefficient would have a distribution about some particular value, which may or may not include zero. The larger the sample the smaller the probability that we will observe a value for the statistic which is in the extreme tails of this distribution. Thus, the observance of an estimate *significantly* different from zero in a large sample means that there is a low probability that the true value in the population is zero. In repeated large samples we should find that the observed statistic is also a reasonably close estimate of the true population value as indicated by a small value for the standard error of the estimate. In small samples the sampling variation in the estimate (standard error) in repeated samples may be large, hence the absolute value of the estimate has to be larger in a small sample before we infer that the true population value is different from zero.

The basis of most inferential statistics is the assumption of an infinite population and an infinite set of samples randomly drawn, with replacement, from that population. Studies of the effectiveness of schooling require samples to be drawn within schools and classes and if the research is based on a large sample of schools (classes), the samples within each unit will generally, for reasons of limited resources, be of less than fifty pupils. In some schools fifty pupils is a much larger fraction of the total enrollment of the school than it is within others. Although we generally make the assumption that statistical tests based on the notion of a sample drawn from an infinite population are valid in these conditions, they need to be interpreted with some caution. In particular, how a statistic, say, a correlation coefficient,

should be interpreted if it is not large enough to be statistically significant in a small sample, even though it may be based on a high proportion of the students in a school (class), is open to question. Statistical significance and substantive importance are always quite different aspects of the interpretation of such a statistic but this distinction takes on added importance in the types of data typically encountered in research on the effectiveness of schooling. For example, an estimated correlation coefficient has to be at least .44 before it is statistically significant at the 5 percent level in a sample of 20 but only .19 in a sample of 100. Although both coefficients are statistically significant we would make quite different substantive inferences from the magnitude of each of these estimates, given knowledge of the sampling fraction and size of the 'population' on which they are based.

The complex hypotheses of structural models represent a joint hypothesis that the set of variables and the relationships specified between them account for the variation in the data, in addition to a set of individual hypotheses that each of the individual relationships between the dependent variables and independent variables is non-zero. The latter set of tests are subject to the caveats noted above, but the former set have additional implications for the relationship between exploratory analyses and statistical testing.

If we are attempting to explain the structure of the relationships between all the variables in the model, that is, to model the causal connections in the data in terms of the variation between variables which are considered to be mediating constructs in the process, then an exploratory mode of analysis which is informed primarily by the data at hand does not lead to a *test* of the model. Any model can be made to fit the data by sequentially specifying additional relationships between variables until the model so constructed actually accounts for all of the variation in the data for the sample at hand. It is then not a test of the model to ask whether or not it would fit the data for

the population, as the relationship between the model and the data has been trivialised by the exploratory fitting process. A statistical test of whether or not a specific theoretical model could explain the pattern of relationships existing in the population relies on an independence between the process by which the model is constructed and the sample from the population on which it is to be tested. Essentially a test of the fit of a statistical model asks whether the structure of relationships specified in the model could represent the real structures which gave rise to the patterns in the population as represented by the (random) sample of data. Thus, in the process of testing the model the sample is an intermediary between the relationships posited in the substantive model and represented by the statistical model, and the grid of relationships existing in the population. For this reason it does not suffice to test the evidence gleaned by exploratory constructions of explanations based on the data in the same sample as that in which those exploratory analyses were conducted. Such a strategy is tantamount to testing the interpretation of the data against itself and as such the *test* is a *non-sequitur.*

Although most research on the effectiveness of schooling does not employ a methodology which formally constructs and tests explanatory models in the confirmatory style of analysis outlined above, the informal interpretative processes employed in this research are, nevertheless, of a similar kind. Typically, various exploratory analyses of the data lead to the statistical testing of simple univariate or bivariate hypotheses and at a later stage more complex hypotheses are tested in a multivariate framework. However, the formal statistical testing of the efficacy of the model which is built-up by this methodology is rarely undertaken. Of course, by the argument above, such testing would require data which had not been employed in the exploratory construction of the explanation. Thus, in order to accumulate knowledge it is important that these exploratory constructions of explanations be tested in a confirmatory

analysis at some stage. This may be achieved by either holding back a portion of the data for purposes of replicating and testing the analyses or, by incorporating the findings from these analyses in new studies. It is the latter of these two alternatives which is most common in practice, in that the substantive model for subsequent research studies incorporates findings from previous research. However, it is my impression that the testing of these substantive models is haphazard and it is often unclear to what extent the initial substantive model explained the variation in the data and, what its weaknesses were. Since we are always testing a complex of hypotheses it is not possible to formally attribute a failure of a particular model to explain the data satisfactorily to specific parts of the model.

It is sometimes misunderstood that this process of accumulating evidence must proceed in a particular order. This is a mistaken view which rests on the assumption that all knowledge must be comprehensible in some global framework. Clearly, as the research on the effectiveness of schooling has indicated many times in the last two decades, there is always evidence available which contradicts other evidence, hence a requirement of comprehensiveness at every point in time would be untenable. It is only within frameworks, and preferably within projects, that some sort of logical ordering of the production and testing of evidence be maintained if we are to build up a cumulative picture of the phenomena of schooling in some coherent way. Thus the research within a particular framework needs to be of a programmatic character. Basic postulates of the substantive model should be tested before the full model is investigated and both of these phases should precede widescale exploratory analyses of the data. Note that here I am stressing that there are two basic sources of information available in a research programme. First, there is the information embodied in past research findings and other knowledge available at the start of the research. Second, there is the information available in the empirical patterns of the relationships exhibited in the data.

Focusing on just one or other of these sources of information fails to take advantage of a third source of information, that available from bringing the first two into juxtaposition with each other, ie. of testing the efficacy of the first as a potential source of explanation for the second.

Research which does not seek this third source of information fails to provide evidence of a *critical* nature in the process of accumulating knowledge within a particular substantive framework. Often this task is undertaken as the *secondary (re)analysis* of data but this aspect of research on data on schooling has been conspicuous by its absence in Britain. A measure of the valuable contribution which this phase of research can make may be judged from the reanalyses of the High School and Beyond data on American schooling since Coleman, Hoffer and Kilgore (1982c) published their study based on these data. Not only have the re-analyses added much to the substantive debate, but they have also been instrumental in advancing the methodological and statistical frameworks for quantitative research on schooling.[3]

One may conjecture that the main reason for the relative absence of such secondary analyses in British research, and the informed debate which they could promote, rests on the failure of research organisations to honour the principal of open access to the data generated by research projects, usually with public funds. There are, of course, complex issues to do with the confidential nature of data on schooling and the propriety of giving those who have collected the data a generous first use of that data, but such issues should not lead to the present situation in which the research community must often conduct debate without access to the basic information on which published studies are based. There is a large amount of valuable data on the British school system which has been collected and analysed for a

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[3] Chapter 3 discussed this study.

variety of purposes, but there is only case of a major re-analysis of a study published in the last decade (Aitkin and Bennett, 1980).

The problem of accumulating knowledge on the effectiveness of schooling is exemplified by the following statement: "The problems caused by our atheoreticism....are now numerous. No piece of work is cumulative, either set against work from the past or against other work in the present.... Work is not testable in theoretic terms and does not generate any middle range theory, which is the building block of any attempted construction of meta-theory" (Reynolds and Reid, 1985, pp200).

The analyses presented in chapters 9-11 attempt to offer a small contribution to the accumulation of knowledge under the methodological prescriptions argued for above. These analyses explicitly formulate models of variation in effectiveness between school sectors on the basis of a prior theoretical framework and extant knowledge of the effectiveness of schooling, before testing the efficacy of the models to explain the relationships embodied in a publicly available data set.

Generalisations from samples to the population of all schools

The question of representativeness is relevant at two levels of observation in the data employed in studies of school effectiveness. First, assuming that we wish to make general statements about schools in the system, we require a sample which represents both the range and distribution of schools with respect to the characteristics which influence differences in outcomes, and with respect to particular hypothesis (eg. do comprehensives perform better than selective schools?). Representativeness in this sense may be obtained either by some form of random or quasi-random sampling of schools from the population of all schools, by a quota or matrix sampling strategy, or by including all schools from the population in the sample. In the first two cases analyses of the data are conducted on the

basis that the effects of schools in the data are a random effect, and it therefore random sampling from the population of effects in order to make inference to the general population of schools. If all schools from the population are included in the sample then problems of inference from the sample to the population are trivial since the sample and the population have the same (identical) membership. If we have data from a non-random sample of schools which is not representative of any particular sub-population of schools then analyses must be premised on the basis that the school effects observed are fixed effects for that set of schools only (eg. for the Inner London comprehensives in the study by Rutter *et al* (1979)). Where there is evidence available from several non-random samples drawn from different parts of the population of all schools, then there may be a basis for extra-statistical inferences about the effects to schools in general.

Recent methodological developments also suggest that it is feasible to conduct quantitative syntheses of findings across studies based on non-random samples and to make statistical inferences based on such syntheses. The technique is known as meta-analysis (Hedges and Olkin, 1985; Glass, McGaw and Smith, 1981), and in order to make statistical inferences from several independent, and possibly individually non-representative studies it is necessary to assume either that the population of effects for schools in the particular system under study is of a known form or that collectively the individual studies represent a random sampling from the population of such effects, which are asymptotically normally distributed. The validity of the technique thus rests on the availability of a sufficiently large number of independent studies and on the assumption that they are representative of the population of effects in the system.

The second level at which the issue of representativeness is relevant is with respect to the distribution of effects within individual schools in the sample. If we utilise a model which assumes that the effectiveness of a school is the same for all pupils in the school, for example that the mean outcome score across all pupils is considered an appropriate measure for the school, and hence of all pupils within it, then this aspect of representativeness is redundant with respect to the framework in which such an analysis is set. However, variation in effectiveness within schools is an important aspect of the effectiveness of schooling (Burstein and Gustaffson, 1983; Cuttance, 1984; Raudenbush and Bryk, 1986). Thus, the representativeness of the samples of pupils within schools is important for the validity of inferences drawn about the school system. Obviously, a non-representative sample of students within a given school will result in incorrect inferences about the population of pupils in the school.

Consistent findings across studies provide evidence for inferences statements about the population of all schools. Further, provided information is available which allows us to locate the schools and pupils in non-representative studies in the overall distribution of the effects of schools in the population, it is possible to relate the findings from each study to an overall picture of the effectiveness of schools. Thus, findings from large scale and small scale studies as discussed earlier can complement each other. Both types of study provide relevant yet different information on the system of schooling. However, there are dangers in making inferences to schools in general, as many did from the findings from the Rutter *et al* (1979) study, when the sample is neither representative of the population of all schools nor can be placed in a context where other relevant studies offer corroborative evidence of the findings.

A Statistical Model of the Effectiveness of Schooling

This section develops a statistical model for studying the effectiveness of schooling. A conceptual model of the relationships between pupils, schools, and sectors in relation to pupil-level outcomes is discussed first, before translating it into a statistical model to be used for estimating the parameters of the model. Finally, statistical issues in estimating such a model are addressed.

Conceptualising and measuring effectiveness

The concept of school performance found in the popular press, and that which is probably most prevalent in evaluations by parents of individual schools is based on what Gray and Hannan (1986) called the *standards* model. This model references the performance of schools against some external norm or standard, usually the average performance of all pupils in the system. The assessment of the performance of individual schools, or sectors (eg. EAs), is undertaken by comparing the average performance of pupils in a given school with the average performance of pupils across all schools. Figure 5.4 illustrates this model. The performance of schools is assessed on the basis of where they lie on the continuum from the lowest to the highest level of performance, those above the centre line are said to be performing 'above average' and those below this line as 'below average'.

Probably the major single problem with this performance model for assessing the effectiveness of schools is its failure to take account of the intake characteristics of the pupils in schools, thus it cannot indicate which schools are the most effective in terms of the *progress* their pupils make. That is, it does not indicate effectiveness in terms of the net gains made by pupils during the period in which they are in any particular school.

Figure 5.4 The standards model of school performance

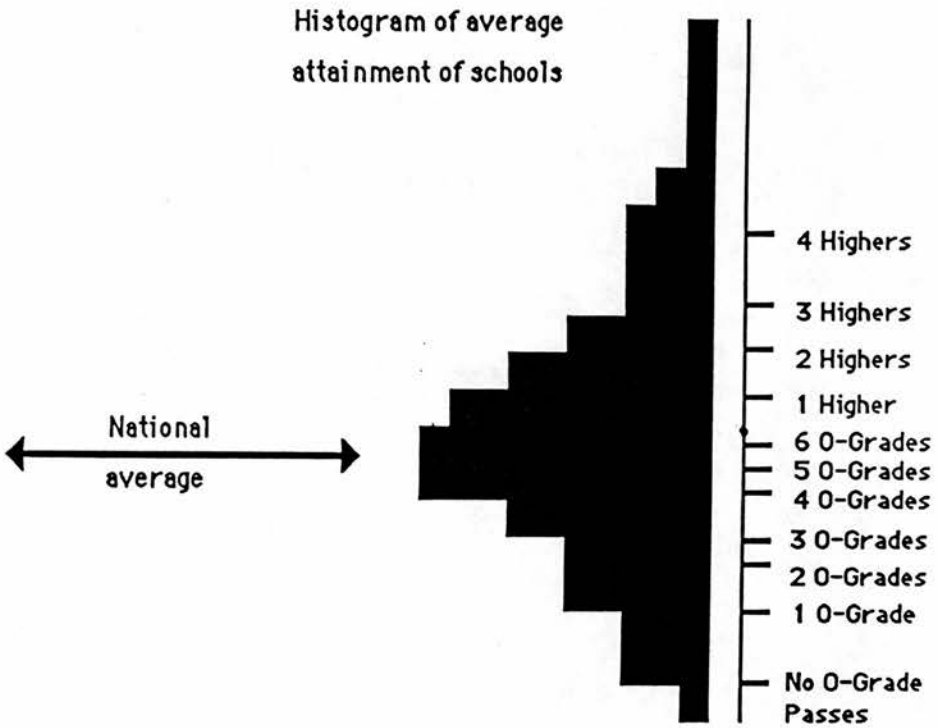
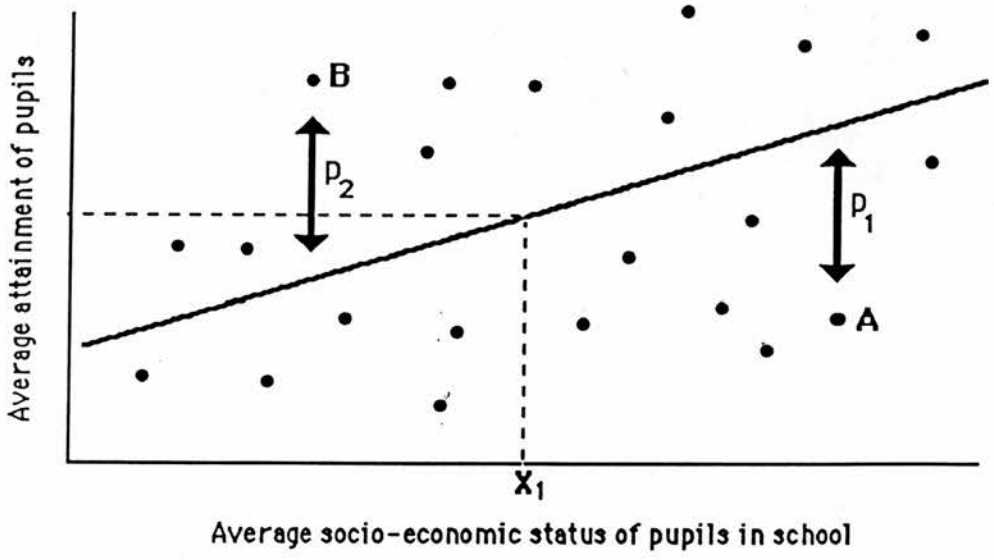


Figure 5.5 School-level intake adjusted model



Models of the effectiveness of schools attempt to assess performance on the basis of pupil progress by taking account of the variation in the intake characteristics of pupils across schools. Ideally, this should be accomplished by using a measure of attainment taken at the point of entry into the school. However, most measures of attainment that are appropriate at the point of entry to any stage of schooling are generally not also appropriate at the stage at which pupils exit from that stage of schooling.

Measure that adequately capture the variation in the skills and knowledge across the range of pupils, say, at entry to secondary schooling, are unlikely to also be able to adequately capture either the full range of or level of skills and knowledge attained at the time the pupil leaves secondary schooling. This is due to the fact that the type of skills and knowledge that characterise pupils at the various stages of schooling cannot necessarily be viewed as cumulative within a linear hierarchical structure of learning. Thus, it is unlikely that any single measure that is appropriate at entry to any stage of schooling will also be sensitive to the particular curriculum that the pupil has been exposed to during that stage of schooling. For this reason, plus the practical consideration that such prior information on attainment is rarely available for matching with data on pupil attainment for cohorts as they exit from each stage of schooling, it is often necessary to adopt a second best solution to the problem of adjusting for variation in the prior attainments of pupils at the time of their intake to each stage of schooling. The solution generally adopted is to employ measures of the ascribed characteristics of pupils known to be associated with attainment, such as pupil social class, parental education, and where available, measures of pupil prior attainment in cognate curicula areas, to control for variation in the pupil intakes to schools. The crucial issue here is the control for factors that vary across *schools* in terms of the characteristics of their pupil intakes, rather than the degree of predictive validity that the model has in

terms of accounting for variation in attainment among pupils. Only in the strict case where the intake and final attainment measures are the same is it possible to measure pupil *gains*, and since it is generally not possible to control completely for all entry level factors that influence final attainment, all estimates of pupil attainment from these models are *conditional* on the controls for pupil background characteristics included in the model. A valid comparison of conditional estimates of attainment across schools is possible provided one crucial condition is met: the conditional estimates of average school attainment must not vary with pupil intake characteristics that are unmeasured in the model. Indicators of school effectiveness that are based on these considerations are referred to as *intake adjusted* estimates.

Until recently the importance of assessing the effectiveness of individual schools on the basis of pupil-level, rather than school-level, information had not been recognised and most studies employed pupil-level data aggregated to form school-level information. The effectiveness of individual schools was measured by the degree to which they were under- or over-performing after adjusting for the average social and prior attainment *composition* of their pupil intake. Figure 5.5 illustrates this model. The regression line[4] calculated as the best fitting line through the school means for pupil outcomes and intake composition provides the *best* prediction of the performance of schools at each level of intake composition. For example, a school with an average intake composition measured at point X_1 on the horizontal axis has an expected performance as indicated by the line drawn vertically to the regression line and

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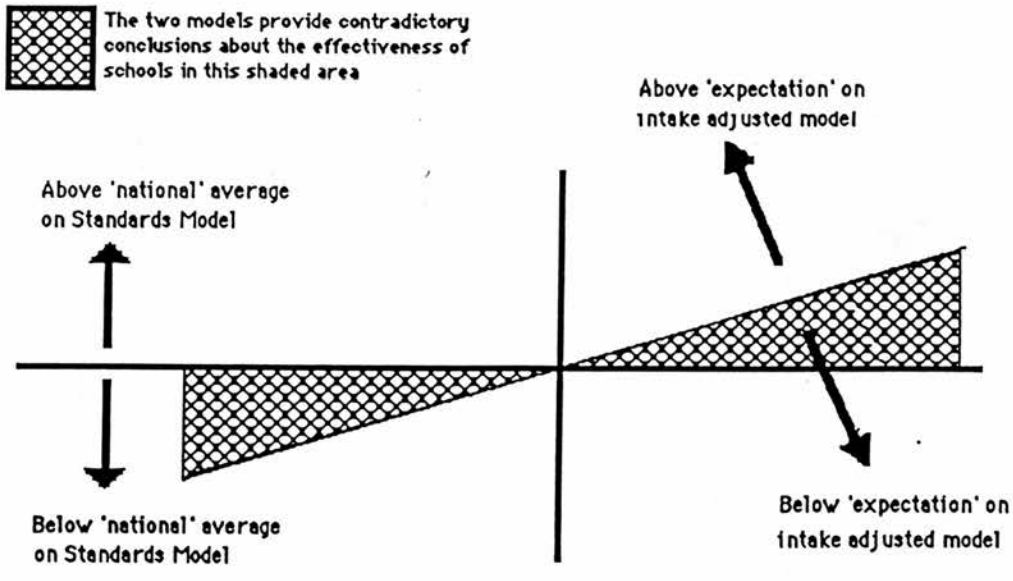
[4] For the purposes of this exposition the relationship between pupil background characteristics and attainment is assumed to be linear. In practice, the specification of models to explain real data requires the investigation of this, an other, assumptions about the functional form of the relationships between the covariates and the dependent variable.

then horizontally across to the outcome axis at point Y_1. School A which lies below the regression line is performing below expectation by the amount indicated by the vertical distance to the regression line (p_1). Likewise school B which lies above the regression line is performing above expectation by an amount indicated by the vertical distance (p_2) that it lies above the regression line. The upward sloping regression line reflects the fact that schools with below average intake composition (eg. below average prior attainment, or below average social class) perform at lower levels than those with higher intake composition. However, schools with below average intake composition may still be found to be effective in this model, as shown by school B. But because of the fact that the average intake composition and the average performance of pupils are positively correlated, schools with below average intake composition are more likely to be below the national average in performance.

These school-level *standards* and *intake adjusted* models of effectiveness may lead us to contradictory conclusions about the effectiveness of individual schools. Figure 5.6 superimposes the two models on the same axes. Schools above the centre line are performing above the national mean, hence would be termed *above average* under the standards model, but those in the shaded area to the right of the vertical axis are performing below expectation in the context of the intake-adjusted model, given the above average composition of their intake. Similarly, schools below the centre line are performing below the national average in terms of the standards model, but they are performing above expectation in terms of the intake adjusted model if they fall within the shaded area, given their intakes.

Figure 5.6 Standards model superimposed on the school-level intake adjusted model



Clearly, a failure to adjust the measures of effectiveness for variation between schools in the characteristics of pupils at the time of their intake to the school invalidates them as measures of the value-added by the school concerned, hence the contradictions just shown need not concern us further. An unadjusted (ie. standards) model of effectiveness only provides us with the level of the average attainment of pupils in a school; it does not inform us about the extent of pupil progress within each school. This level of performance is the product of many non-school factors in addition to school factors, in particular it depends crucially on the level of prior attainment of pupils at the time of their intake to the school, hence it is not appropriate to interpret it as a direct measure of the effectiveness *per se* of schools.

Thus far the discussion has been in terms of the average performance of pupils in each school, however, it is clear that since there is a correlation between ascribed pupil characteristics and individual pupil attainment, not all pupils within a school will have the same level of attainment. The level of attainment for pupils of high prior attainment/social class[5] is usually found to be higher than that for pupils of lower prior attainment/social class . Hence there is likely to be a gradient in performance along a prior attainment/social class continuum *within* schools, in addition to that which exists *between* schools of differing intake composition.

Two technical terms, *equity* and *quality*, are introduced to describe these dimensions of effectiveness. Figure 5.7 shows the within-school regression lines for four hypothetical schools. All pupils in schools A and B perform at higher levels than those in schools C and D, for all levels of pupil prior attainment/social

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[5] The term 'prior attainment/social class' is employed as a shorthand notation for 'prior attainment or social class'; it does not imply a particular correlation between the two.

class. Thus, regardless of whether pupils were of lower or higher prior attainment/social class, they would perform better in schools A and B, than in schools C and D. This represents the dimension of school quality, and in technical terms, can be modelled as the *intercept* in the regression equation for each school.

Within each of the four schools in Figure 5.7 there is a gradient describing the difference in performance between pupils of higher and lower prior attainment/social class. This gradient will be referred to as the *equity differential* within a school or sector, and it is modelled as the *slope* of the regression line in each school, or sector. For analytical purposes, schools which have steep slopes are designated as *disequalising*, because in comparison with other schools, they promote the attainment of pupils of higher prior attainment/social class to a much greater extent than those of lower prior attainment/social class. Schools with flatter slopes are designated as *equalising*, because they promote the attainment of pupils of lower prior attainment/social class in comparison with those of higher prior attainment/social class more so than other schools. This does not mean that pupils from lower prior attainment/social class perform better than those of higher prior attainment/social class in equalising schools, merely that the differential between the two groups is less in such schools.

Figure 5.7 Pupil attainment in four schools

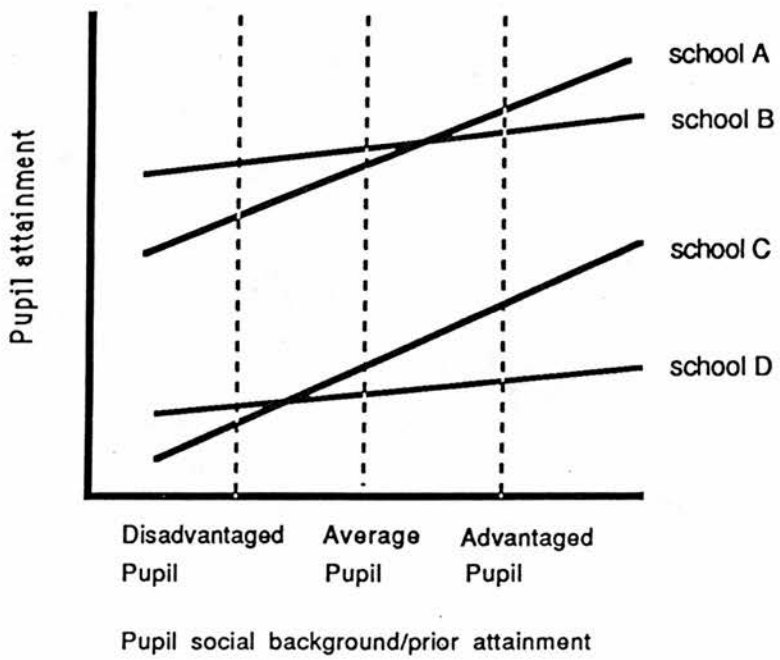

Figure 5.8 School Quality x Equity

Equity \ Quality		
	A High Quality & Disequalising	B High Quality & Equalising
	C Low Quality & Equalising	D Low Quality & Disequalising

The terms *advantaged* and *disadvantaged* are now introduced to refer to pupils whose prior attainment/social class is above, or below, respectively, that of the *nationally* average pupil [6]. In figure 5.7 the regression lines for schools A and B intersect, indicating that pupils of all prior attainment/social class levels do not perform better in school A than in school B, and *vice versa*. Socially disadvantaged pupils perform better in school B while socially advantaged pupils perform better in school A. The expected performance of a pupil of given prior attainment/social class depends on both the quality (intercept) and the equity differential (slope) for each school. From this analysis of the dimensionallity of the effectiveness of schooling it is possible to classify the effectiveness of every school in a two-fold table with quality on one dimension and equity on the other, as in figure 5.8. Clearly it would be desirable to move toward a system in which all schools have a high performance on the quality dimension. However, whether equalising or disequalising schools are to be preferred depends on social valuations and judgements about the degree of differentiation in performance considered appropriate between socially advantaged and socially disadvantaged pupils.

Modelling variation between educational units

The two-dimensional model of school effectiveness just outlined requires the analyses of data on pupil performance at a

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[6] The analyses in chapters 8 and 9 focuses on the effectiveness of schools for pupils characterised as disadvantaged, average, or advantaged. An alternative way of considering the effectiveness of schools is to investigate the mean level of attainment for each school after pupil prior attainment/social class has been taken into account, as in chapters 10-12. The two ways of analysing the data provide similar information about the effectiveness of schools, but they reference this information differently. The former approach allows a direct comparison of the effectiveness of schools for pupils of particular characteristics, while the alternative allows a direct comparison between schools, or sectors, in terms of the mean performance of their pupils. Both types of comparison allow for adjustments for the variation between schools in the intake characteristics of pupils before estimating the effectiveness of schools.

pupil-level rather than at an aggregated school-level, and that it is vital for the model to take account of between-school variation in pupil prior attainment and social background characteristics.[7] Further, it would be desirable to be able to analyse the variation in performance *across outcomes* at each level in the system. At the present stage in the development of this methodology, the software that would allow such an analysis to be conducted is not generally available. The current state of the development of the methodology for multilevel modelling (Goldstein, 1986; Aitkin and Longford, 1986; Raudenbush and Bryk, 1986) allows for such modelling only in the context where the levels are nested within each other, and for only one outcome at a time.

There are also other considerations that are relevant when deciding on the appropriate methods for estimating multilevel statistical models. First, where the sample of pupils is widely dispersed across many units with few pupils in each unit, consideration needs to be given to the stability of the estimated regression line within units, particularly if the method employed estimates the regression equation separately for each unit. This is particularly likely to be the case when schools, or classrooms, are the focus of the analysis, with few pupils in the sample for each school or classroom. However, even analyses at the EA level will suffer from unstable regression estimates within EAs if the number of pupils sampled within each school is small. Second, if there is clustering at lower levels within units, eg classrooms within schools, then it is almost certain that inferences based on estimates of variation at higher-levels will be incorrect if they fail to model this lower level variation. In this case a multilevel statistical model, which either simultaneously or iteratively estimates the parameters between levels is required to obtain appropriate estimates of the variation at each level. In the analyses reported in chapter 8, two approaches to the estimation

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[7] In principal, the model needs to take account of all factors that are associated with variation in pupils between schools.and are related to subsequent attainment

of multilevel models are used to assess variation in effectiveness among schools.

The discussion thus far has accepted the conventional criteria of comparison between schools and educational sectors: that the important policy and educational differences between schools or sectors are revealed by an analysis of the differences in the *mean* performance of schools. The extension of this methodology to encompass an evaluation of the performance of pupils designated as socially disadvantaged, average, or advantaged provides additional information about the variation in the system, but this still does not present a full perspective of the degree of variation within and between schools and educational sectors. For example, an analysis which found that one educational authority performed at a higher level than another in terms of pupils defined as disadvantaged, say, would not indicate the extent or form of variation in performance within and between these two sectors. It is probable that many of the schools within the EA with the higher performance would be performing at a lower level than some of the schools in the EA with the lower level of performance, for pupils defined on the above criteria. Further, the performance of schools in one EA may be much more variable than in the other EA. Depending on the intent of a particular policy or educational question, the extent and form of variation in attainment between pupils within sectors or schools may also be of relevance, in addition to the relative performance of schools for pupils of particular characteristics. The empirical analyses in chapters 7-12 employ graphical displays known as boxplots (Tukey, 1977; McGill, Tukey, and Larsen, 1978) to describe the intake characteristics of schools, and to indicate the distribution of estimates of school effectiveness within and between sectors.

The statistical formulation of the model

A decade ago researchers analysing data on schooling began to pay particular attention to the multilevel structure of such data. It was recognised that the information on pupils was also the carrier of additional information on classrooms, schools, and further levels of the educational structure above that of the school (Bidwell and Kasarda, 1980; Burstein, 1980). This presented a statistical problem as to how to estimate the relationships at each level, that is, between-pupils, between-schools, between-EAs or school districts, etc, while taking cognisance of the fact that the data on individual pupils actually embodied the effects of influences at all these levels.

The solution to this problem has typically been handled by a regression analysis which, although incorporating covariates to control for the intake characteristics of individual pupils, constrained the within-school relationships between these intake characteristics and pupil outcomes (the equity differentials) to be the same in all schools. That is, it constrained the regression slopes to be constant across all schools. This model is represented by the following equation:

$$y_{ij} = \alpha_0 + \beta X_{ij} + \gamma_j + \varepsilon_{ij} \qquad 5.1$$

Here y_{ij} is a pupil outcome and X_{ij} is a pupil intake characteristic. The subscripts *i* and *j* designate pupils and schools, respectively. The adjusted estimate of the effectiveness of each school is represented by $(\alpha_0 + \gamma_j)$. The ε_{ij} term represents the variation in y_{ij} not explained by the model, usually assumed to be normally distributed with constant variance and independent from pupil to pupil. In general the model can be expanded to deal with multiple covariates, in place of the single X_{ij}. Such models have typically included measures of all or some of the following characteristics of pupils at the time of their intake to the school: pupil social background, parental education, family size, and pupil attainment. The outcome measure has usually been based on a standardised test of pupil knowledge or attainment, or alternatively, on achieved grades in nationally administered examinations.

Recently the argument that the constraint on slopes across schools fails to allow for equity differentials in the variation between schools has lead to the consideration of more complex models which allow for variation in both quality and equity between schools. An extension to equation 5.1 above which contains a set of interaction terms representing the slopes for each school is one way of allowing for different equity differentials (slopes) in each school. This latter model is represented by the following equation:

$$y_{ij} = \alpha_0 + \beta X_{ij} + \gamma_j + \lambda_j X_{ij} + \varepsilon_{ij} \qquad 5.2$$

As in the previous model, the adjusted estimates of school effectiveness are represented by $(\alpha_0 + \gamma_j)$, but because slopes are now allowed to vary from school to school there may be disordinal interactions (ie. the regression lines may cross-over) as in figure 5.7. Thus, the estimate of the effectiveness of schools in relation to each other will depend on the values of the covariates on the the horizontal axis in figure 5.7 at which the estimate is computed.[8] This model is equivalent to specifying an aptitude-treatment interaction (ATI) model of the relationships between pupil-level and school-level variables. Schools are analogous to the 'treatments', which themselves have a differential impact that is dependent on the values of the covariates. In a similar vein, the model in equation 5.1 with constant slopes across all schools is analogous to an ANCOVA model, again with school effects as the 'treatment' effects. In the ANCOVA model the treatment is assumed to have an equal impact at all covariate levels.

A first attempt at a comprehensive solution to the problem of estimating a model in which both quality and equity is allowed

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[8] In general, several covariates will be included in the model and the disordinal interactions (crossovers in Figure 5.7) may occur for any of the covariates. The application of this model to a particular problem would require that each of these potential sources of interaction be investigated.

to vary among schools was presented by Cronbach, (1976, and by Burstein and Miller (1980). The solution suggested was to treat each unit (say, a classroom, or school) separately, and to estimate the performance of pupils within each before utilising this information in a second stage of the analysis to assess the relationship between the units at the next higher level.

In this model the estimates of the relationships in figure 5.7 for each school are obtained by estimating the following equation separately for each school:

$$y_{ij} = \alpha_j + \beta_j X_{ij} + \varepsilon_{ij} \qquad 5.3$$

The slopes (equity differentials) are represented by the β_j and are allowed to vary from school to school, since the equation is estimated separately for each school using just the data for that school. The only statistical difference between this model and that specified in equation 5.2 is that the estimation in the former case pools the residuals from all schools, which is generally of little significance. There are, however, two practical differences in the estimation of the two models. The pooled model in equation 5.2 contains one $\lambda_j X_{ij}$ term for each school-by-covariate interaction. Thus, in the case of an expanded model with several covariates, it can contain a large number of parameters to be estimated. Although the actual number of parameters to be estimated in 5.2 and 5.3 are the same in each case, fewer numerical estimation problems will, in general, be encountered in the estimation of 5.3. In equation 5.3 the estimates of quality for each school are represented by the intercept α_j in the equation for each school. These equations are a direct statistical representation of the relationship between the performance level, shown on then vertical axis, and prior attainment/social class characteristics of pupils shown on the horizontal axis in figure 5.7. Indeed, if it was necessary to take account of just the one measure of pupil prior attainment/social background, then it would be possible to use simple graphical approaches to the estimation of the effectiveness of schools, although they would

ignore the sampling error in the data. But we generally wish to take account of multiple measures of prior attainment/social background, in which case statistical methods are to be preferred, as graphical methods for more than two or three dimensions would be particularly unwieldy.

By adding a second stage to the model in equation 5.3 we obtain what is known as the *slopes-as-outcomes* model (Burstein and Miller, 1980). This second stage takes the school level parameters from the above equation (the α_j and the β_j) and employs them as dependent variables to be modelled by regressing school-level characteristics on them. Thus we can set-up an extension to the model in equation 5.3 which treats the estimates of school quality and equity as response variables to be explained by school or other sector-level factors.

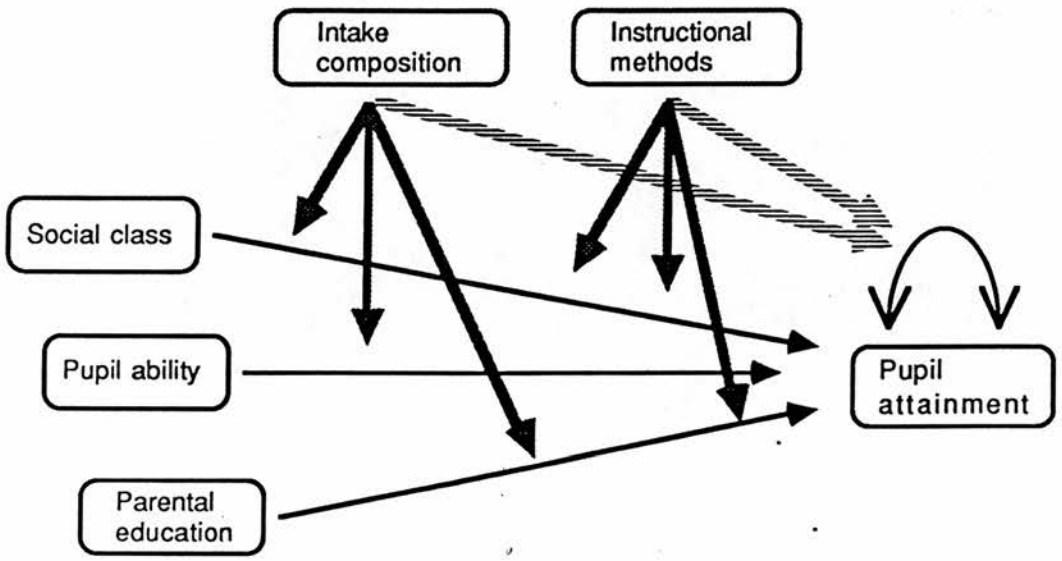
$$\alpha_j = \delta_0 + \omega_0 Z_j + \mu_{j0} \qquad 5.4$$

$$\beta_j = \delta_1 + \omega_1 Z_j + \mu_{j1} \qquad 5.5$$

The Z_j represents an explanatory characteristic of schools. The coefficient ω_0 in equation 5.4 indicates the effect of this characteristic on the estimated quality of schools, and the coefficient in ω_1 equation 5.5 indicates the effect on equity differentials within schools.

This model is depicted in figure 5.9. The lines drawn from the pupil-level covariates to the outcome measure represent the regression slopes within-schools, and the double-arrowed curved line attached to the outcome measure represents the adjusted estimates of attainment. The arrowed lines emanating from the school-level process constructs then indicate that these factors are modelled as higher-level causal influences that determine the variation in within school slopes and in adjusted mean attainment.

Figure 5.9 Conceptual structure of the multilevel model



The model defined by equations 5.3 - 5.5 can be estimated as a set of fixed effects regression models. First, equation 5.3, the within-school part of the model is estimated, and then the estimates of school quality and equity from this analysis would be used as the dependent variables in the second stage to estimate the between-school part of the model in equations 5.4 and 5.5. This approach has been referred to as the slopes-as-outcomes model (Burstein and Miller, 1980). There are, however, some significant problems with it. In particular, the estimates are *ipso facto* estimated rather than known values for each school. An assumption that the estimates from this method are fixed values does not bias the second stage estimates based on them when they are employed in the between-school part of the model (equations 5.4 and 5.5), but those estimates are statistically inefficient (ie. they have larger than necessary sampling error), and this reduces the power of the model to detect and evaluate relationships between school and sector characteristics and school quality and equity differentials. In particular, the power of tests of the null hypothesis that statistically significant relationships between school characteristics and effectiveness do exist is seriously weakened. Further, the the variation in equity and quality that is explained by school-level variables in the model is seriously missrepresented. This is due to the fact that the the fixed effects regression model treats all variation in the dependent variable as systematic variation to be explained by the independent variables in the model, whereas in this case we know that a portion of the variation in the dependent variables is non-systematic (random) sampling variation. This method is employed in chapter 8 as one approach to estimating the effectiveness of schools for pupils of different types. It will be referred to as the *fixed effects* regression model.

When schools and pupils are sampled from the population the effects associated with schools are more appropriately estimated as *random effects*, as the effects for the particular units sampled

are a random sampling from the universe of such effects that are assumed to exist in the population to which inference is to be made. Thus, the type of inferences to be drawn from the analyses determine the appropriate specification of the effects. . The sample of schools is not a random sample from the population of all schools, rather it is the enumerated population of all schools. In this case the treatment of effects associated with schools as random effects must appeal to sampling ideas based on the concept of a super-population of schools, or alternatively, their specification as random effects may be viewed as a purely methodological device for handling the large number of schools involved.[9]

The recent development of Empirical Bayes (Raudenbush and Bryk, 1986; Mason, Wong, and Entwistle, 1985), Generalised Least Squares (Goldstein,1986), and Maximum Likelihood (Longford, 1985) estimators for these models have provided more powerful means to investigate the model in equations 5.3 - 5.5. These estimators all treat the effects associated with school quality and equity as random effects.

These advances in estimation rely on particular assumptions about the residual terms in the model and assume that the model is correctly specified, ie. that all of the appropriate factors influencing equity and quality have been included in the model specification. The assumptions made by the various estimators about the distribution of the error terms in the within-school and between-school parts of the model are no more restrictive than those made by most linear model estimators, although the extent to which they are met in the type of data available in school effectiveness research is a matter for empirical inquiry.

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[9] The model specified in 5.3 - 5.5 reduces to the same model as that in 5.2 with covariate-by-school interaction terms if certain restrictions are met (Raudenbush and Bryk, 1986). However, most software available would find that such a task was computationally infeasible for an analysis with more than 100 schools and more than 2 or 3 covariates.

Although the data for the pupil-level outcome variables in the present study have been scaled to approximate a normal distribution, we do not have any direct control over the distribution of the within-school regression coefficients which form the dependent variables in the between-school model, or those which are the dependent variables at the between-sector level.

Raudenbush and Bryk (1986) suggest that the parameter estimates themselves will be relatively robust to the violation of these assumptions, but that we should be careful in interpreting the results of hypothesis tests, and the estimates of variance components on the model. The influence of outlier observations in the within-school data also have the potential to produce misleading estimates of school quality and school equity. Robust multilevel estimation procedures have been applied to data on classrooms and schools (Rachman-Moore and Woolfe, 1984) but the resulting model was relatively restrictive in terms of the relationships across school-level and class-level that it would allow. The inspection of residuals for estimated models can, however, provide evidence as to whether the model is appropriate to the data. Tests of the normality of the residuals (Q-Q plots) provide information on whether or not the basic distributional assumptions of the model have been met, and evidence of the presence of effects due to outlier observations, etc, if they exist. The standard estimation methods employed by these methods weight the outcome variables at the school and sector-levels in accordance with the degree of sampling variation that they are estimated to contain. This feature of the estimators should reduce the chance that *outlier* estimates of school quality and school equity will unduly influence the findings of their systematic relationship to school or sector characteristics.

Discussion

This chapter has discussed three interlocking sets of issues in the modelling of variation of effectiveness among schools. The statistical methodology developed in the final sections provides a basis for the confirmatory modelling of hypotheses about the nature of variation in the system, and it also facilitates the exploration of the variation in the data once a basic substantive model has been specified. The substantive model that is specified must state which school-level factors are to be modelled as determinants of each of the relationships in the pupil-level model. The pupil-level model specifies the equity and quality associated with pupils in each school. The relationship between pupil background characteristics and attainment represent the equity differentials within each school, and the adjusted estimates of pupil attainment represent the quality of attainment for each school. School-level factors are then modelled as the determinants of the variation in equity differentials and in quality among schools.

The models of school effectiveness that underlie many popular comparisons of the performance of schools and earlier research models of variation in effectiveness among schools can be shown to always yield results which will contradict each other for some schools in the system. The simple comparison of schools on the basis of the average examination attainment of their pupils takes no account of the variation in school intakes that exists in most systems. The model which adjusts for school intakes is to be preferred to this raw performance model as it embodies the idea of progress or gain in pupil attainment between the time of entry to and exit from the school. The failure of the raw performance model to take account of prior attainment means that the same level of performance may relate to different levels of progress in different schools. Because of the correlation between the level of prior attainment at entry and attainment at the time of departure, the raw performance model actually

underestimates the performance of schools which have a high proportion of pupils with low levels of prior attainment in their intake, and overestimates the performance of schools with low proportions of such pupils in their intake. It is this feature of the difference between the two models that will always lead them toward contradictory conclusions about the effectiveness of a particular group of schools.

The school-level adjusted model is itself restrictive, in that its interpretation as a model of the effectiveness of schools is predicated on the assumption that schools have effects on pupil attainment which are constant across all pupils within every school. Recasting this assumption into the structure of relationships between pupil entry characteristics and pupil attainment reveals that it is equivalent to the standard analysis of covariance assumption of equal treatment effects, due to its specification of parallel regression slopes across all schools. In more formal terms, this means that the model specifies that the equity differential in all schools is the same, and therefore that the within-school slope are equal to the between school slope. That is, the relationship of entry level pupil background characteristics and attainment at the point of departure from schooling is assumed to be the same for all schools. Further, it treats the effects of schools as fixed effects, which restricts inference to the more general population of schools. In order to make inferences from a sample of schools to the population of all schools it is necessary to treat the effects associated with the schools in any sample of observations as random effects. This is one of the major advances that in embodied in the recent multilevel modelling developments that are discussed in this chapter, and which are employed in the analyses in chapters 8 - 12. Theoretical progress in understanding the sources of variation in school systems, and inferences based on models that are capable of explaining that variation require the sophisticated statistical models that have emerged over the last two years or so.

Inferences based on attempts to model particular theoretical and substantive formulations of the hypothesised causes of variation in quality and equity among schools, and among school sectors, require assumptions about the representativeness of the samples of pupils and schools employed in the analyses. Samples that are not representative of more general populations or subpopulations of schools can only be the basis of extra-statistical inferences about the likely applicability of their findings to other schools, and then only if there is other evidence that corroborates their findings in those, or related situations.

Chapter 6

Data Capture and the Measurement of Variables

Introduction

This chapter describes the data and the measurement of the variables. First, the sample of school leavers is described. Second, the variables employed as individual-level measures are discussed. This second section focuses on the scaling of the outcome variables, and the measures of social background. The items that are employed to construct measures of school process are then discussed in a final section.

Sample and data collection design

The data employed in this study are drawn from the 1981 National School Leavers Survey (Burnhill, Lamb, and Weston, 1984). They relate to pupils who left school at the end of the 1979/80 school session. Because the sample is of pupils who left school in that year it is comprised of the members of the entry cohorts for the years 1974/75 (the sixth-year leavers), 1975/76 (the fifth year leavers), and 1976/77 (the fourth year leavers). The pupils entered over a three year period and moved through the system in a staged manner, thus, the progress through the system of each entry cohort may have been influenced by particular period specific factors that varied from year to year, in addition to any systemic factors that were present throughout the period.

The data employed in the analyses below are, with one or two exceptions, for the full response data set comprised of 23,151 pupils drawn from all 470 schools in the Scottish secondary school system. The target sample had been set at thirty-seven percent of the population and the achieved sample covered approximately seventy-two percent of the target sample (Burnhill, 1984). The questionnaire was stratified in terms of difficulty and length. The overall response rate to the self-completion mail questionnaire was

of the order of seventy percent. However, the response rate varied between qualification groups. The response rate for leavers with *Highers* or *O-Grade* qualifications was of the order of eighty percent, while it was of the order of sixty percent for leavers who had not gained any level of certification in the Scottish Certificate of Education (SCE) examinations. These response patterns indicate that the data are somewhat over-representative of the higher qualified and under-representative of the less qualified leavers in the population.

All pupils and schools represented in the sample were retained in the sample for analysis. Some analyses, however, are based on the subset of schools with more than twenty pupils in the data.[1] In these cases the data were also further restricted to pupils with a complete record of data on their SCE attainment level and social background characteristics. This reduced sample contains 18,202 pupils in 372 schools. The analyses conducted on the full sample employs pairwise deletion of cases to handle missing data.

The survey employed a complex data collection design which was stratified by the level of qualifications that pupils had obtained. A randomly assigned multiple version self-completion postal questionnaire was employed for collecting the data. There were four levels of qualifications employed to stratify and tailor the questionnaire to the likely ability of pupils to respond accurately to it.[2] The survey was a collaborative exercise and a large number of interested groups had items included in the questionnaire, hence the need to versionise it. Eight versions were developed. The survey design crossed the four stratification levels

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[1] Although this criterion is arbitrary, it was judged prudent if the within-school statistics for each school were not to be unduly influenced by the uncertainty of estimates for schools represented by small, possibly unrepresentative, samples. This restricted sample is employed only for estimating the within-school regression model analyses presented in chapter 8, and for analysis of the composition of school intakes in chapters 10 and 11. The full sample is employed for all other analyses.

[2] The levels were 'Highers', 'O-Grade', those who intended to sit O-Grades but in the event did not, and those who did not enter for any SCE examinations before leaving school.

with these eight versions to provided a thirty-two cell item response matrix. Only items considered of central importance were designated as core items to be asked across all levels, and a similar set of criteria operated within levels. Relatively few items were included in all thirty-two cells of the matrix, and many items were included in only two or four of the eight versions at a particular level.

The items relating to pupil social background and biographical characteristics were included in every cell of the matrix, as were the items on pupil qualifications at the time of leaving school. Thus, the measures of pupil attainment and pupil background characteristics are available for all pupils who responded to the questionnaire. The items relating to school process were, however, generally included in between two and six versions of the questionnaire at each level. With a few exceptions, they were also asked at all levels, although some items were asked in a different format across levels.

Pupil-level variables

The individual-level information describes pupils' Scottish Certificate of Education (SCE) attainments in English, arithmetic, and an overall indicator of attainment across all subjects, plus socio-economic characteristics of their families.

The SCE data have been scaled to approximate a normal distribution for each measure. Effectively, this means that each pupil's SCE award in English and arithmetic is rescaled so that the overall distribution, inclusive of those who did not enter for the particular subject, is normal with a mean of zero and unit standard deviation.[3]

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[3] The formula employed to rescale the pupil attainment measures is: $Y = [h(P) - h(p)]/[P-p]$, where $h(p) = p \log_e p + (1-p) \log_e(1-p)$. P is the proportion of pupils attaining at each level or higher, while p is the proportion attaining at a higher level. This is a standard technique for rescaling any empirical distribution to a logistic distribution (Mosteller & Tukey, 1977). The pupils who did not enter for an examination were included in the rescaled distribution, under the assumption that they

The overall measure of SCE attainment is one in which passes at O-grade level are given less weight than those at Highers level. This measure is derived from both the level and the number of awards at O-grade and Highers, and it too has been rescaled on the same basis as for the other two outcome measures. Figure 6.1 shows the rescaled distribution of pupil outcomes and indicates the relationship between the scale and the various levels of attainment for the three outcome measures.

This measure was previously employed in the study of variation in performance in Scottish schools by Gray *et al* (1983) and is the same as that employed in other studies of school effectiveness in these data (McPherson and Willms, 1986, 1987; Willms and Cuttance, 1985). The overall SCE measure is similar to that employed in studies of effectiveness in England by Aitkin and Longford (1986), Mortimore *et al* (1987), and Gray (1986). It is based on a standard treatment of the scoring of grades from more than one examination system, such as O-Level and A-Level in England, and O-Grade and Highers in Scotland. The rationale for scaling the ordered categories on the basis of the logit distribution is the same as that which is employed in the justification of the standardisation of *test scores*. There is no *a priori* claim that the logit or normal distribution is substantively more valid than any other arbitrary choice of distribution, either in the case of test scores or the scaling of examination scores, as is the case in this study. The primary justification for scaling measures of attainment in this way is statistical. The appeal to the Central Limit theorem, and to the more elegant properties of the normal distribution makes it a more obvious choice than others. The logit distribution chosen for this study is similar to the normal distribution, but has a higher proportion of observations in the tails of the distribution.

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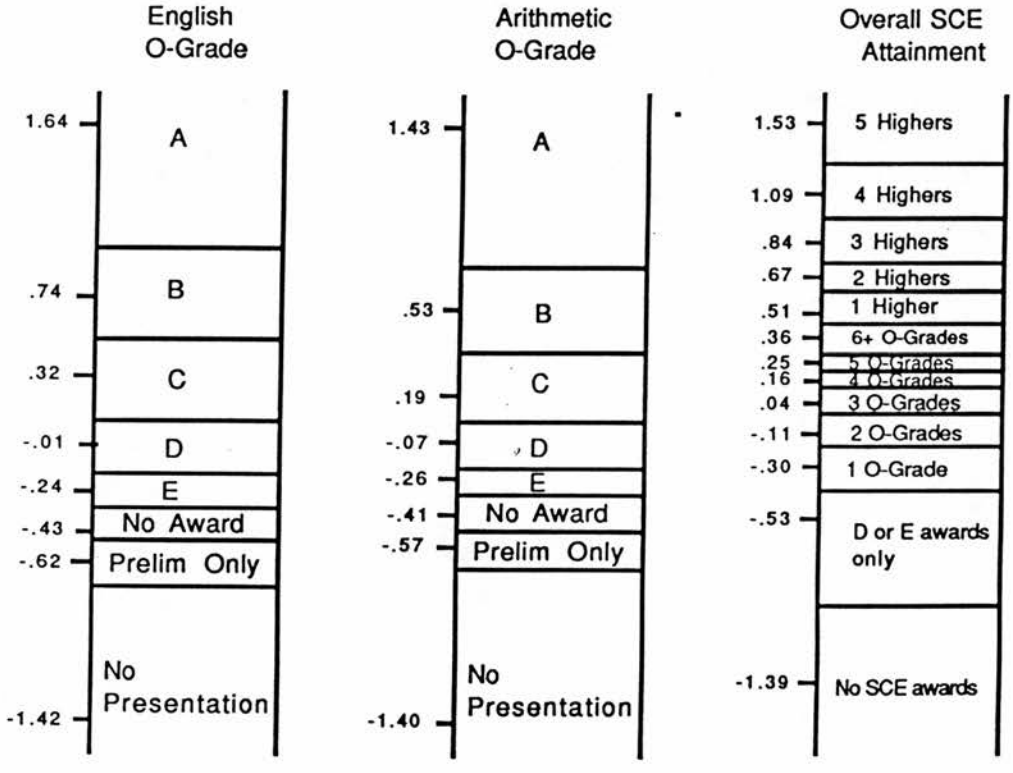
would have scored at a lower level than the lowest attainers who did enter for the examination.

Figure 6.1 Description of scaled attainment measures



The outcome measures of attainment in English and arithmetic were chosen because they are the two core subjects that all pupils study and in which over three-quarters of all pupils present for the Ordinary grade examination.[4] In ordering the categories of marks in these subjects that were obtained by pupils in the sample, a decision was made to assign those who did not present to a category below the lowest grade on the scale (Gray, *et al*, 1983). Among this group a further distinction was made between pupils who entered a preliminary examination in these subjects at school, but who in the event did not present in the SCE examination, and those who did not enter the preliminary examination.[5] All three of the attainment measures have been scaled to have unit variance and a mean of zero. This allows a direct interpretation on the estimates of school means as deviations from the national unadjusted pupil-level mean for each measure. Further, the standardisation to unit mean allows for an interpretation of the estimates of school and sector effects in terms of the standard deviation of the distribution, ie. in terms of *effect sizes* (Hedges and Olkin, 1985).

The socio-economic background data on the pupil's families includes the following: a measure of social class, the level of educational attainment of the pupil's mother, and sibship size. The measure of social class is described in more detail below. The variable measuring mothers education was coded as zero if the mother had left school at fifteen years of age or before, and 1 otherwise. The variable measuring sibship size is a simple count of the number of children in the family, and gender is coded zero for males, and 1 for females. These four measures have each been centred about their mean, hence have a mean of zero. This allows a

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[4] Pupils who entered for the SCE O-grade or Highers examinations, but who did not enter for the arithmetic O-grade were assigned scores on the basis of their results in these former examinations. This assignment affected less than 2 percent of the sample.

[5] Intending entrants for the SCE O-grade examinations normally enter a preliminary 'trial' examination conducted by schools about three months before the public examination.

direct interpretation of the findings of effect sizes as the effects for the pupil of average background characteristics. The standard deviations in the data for the four measures are: social class 12.04; mothers education 0.43; sibship size 1.58; and gender .50. The social class measure is the Registrar General 7-point classification of social class rescaled using weights from the Hope-Goldthorpe classification of socio-economic status (Goldthorpe and Hope, 1974). The weights were derived by assigning a frequency proportional weighting from the Hope-Goldthorpe scale to the occupations in each of the classifications of the Registrar General scale. Thus, each of the seven Register General categories is assigned a weighted mean value on the basis of the Hope-Goldthorpe social status rating of the occupations within that category (Willms and Cuttance, 1986).

The primary purpose of rescaling the Registrar General 7-point classification on the basis described above was to convert the ordered categories into a metric scale that measures the social prestige of occupations. The Hope-Goldthorpe scale, like other prestige scales (eg Trieman, 1977; Duncan, 1961), provides a measure of the relative position of an individual in an hierarchical structure of social stratification, based on their access to, or control over, wealth, prestige, and power. As such, it is employed in this study as an indicator of the social status[6] of pupils' families. The alternative of employing the individual categories of the Registrar General scale as a set of dummy variables was rejected as impractical on the grounds that it would have required the specification of six additional covariates in the model, to represent the seven categories.

Percentile points for the distributions of the covariates are employed to define three types of pseudo pupil: a *disadvantaged pupil* - at the twenty-fifth percentile on all covariates; an *average pupil* - at the fiftieth percentile on all covariates; and an *advantaged pupil* -

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[6] However, in keeping with British usage I shall employ the term 'social class' in its common generic usage in reference to this measure.

at the seventy-fifth percentile on all covariates. Pupil gender, however, is set at a value of .50 in defining all three of these pupil types.

School-level and sector-level measures

Assignment of school sector membership

The sector-level variables available distinguish sector membership, but do not describe qualitative differences between sectors. The data employed for this purpose is based on the classification of the school identifiers into a set of sector classifications. These classifications were first employed in Gray *et al* (1983) and were updated to describe the status of schools for the present leaver cohort by Andrew McPherson, and have been employed in other analyses of the present data by McPherson and Willms (1986). The classifications of school type employed in the analyses in later chapters include the following: the denominational status of schools, the degree of selectivity in school intakes, the era in which individual schools were founded, the type of community in which schools are located, and the educational authority (EA) under whose auspices a school is governed.

Measures of school process

The items measuring school process were collect as part of the self-completion questionnaire sent to school leavers. The items were not designed as part of a planned study of the way in which school processes influence the outcomes of pupils. Rather, they were collected for a variety of purposes, only one of which related to their potential as explanatory factors in models of school effectiveness. Many of the items had been collected from preceding cohorts of school leavers and their availability owes more to the maintenance of temporal continuity in the item set for the survey series, than to the substantive use to which they are now put. In

total only about twenty items were added to the survey with a specific intent that they might shed light on differences in effectiveness between schools. The study of school effectiveness at the Centre for Educational Sociology was only in an emergent phase at the time these data were collected and they represent what would now be viewed as a limited subset of the data that might be collected in a focussed study of the effectiveness of schooling. They do not represent the full set of conceptual domains that one would now define as being potentially important explanatory factors in any significant study of the effectiveness of schooling, nor do they fully represent particular domains of a conceptual model of effectiveness such as would be constructed from the review of the literature in earlier chapters. However, the focus of the present study is on variation in effectiveness among sectors of schools, and the school process data are employed as a supporting cast in an initial exploratory investigation of factors that might be responsible for any variation among sectors.

Appendix A lists the items that have been extracted from the data base for use in the present study. All items that were thought to be possible indicators of school process were extracted. Because individual items were included in only one quarter to one half of the cells in the questionnaire matrix, and not all items were included in the same set of cells, they are not suitable for use as measures at the individual pupil-level. In order to construct school-level process measures from them, each item was first aggregated to form a school-level indicator. In all cases this aggregation procedure is based on the percentage of pupils responding to one or a specified set of the potential response categories for the item. The response categories that were the basis of the aggregation for each item are described in the appendix. A more detailed discussion of these items and an analysis of the structure of variation among them is provided in the next chapter, which also develops a set of school process constructs based on them.

Chapter 7

The Structure of Relationships Among the School Process and Intake Composition Measures

Introduction

Several studies of schooling over the past two decades have suggested that there is a substantial relationship between pupil attainment and the intake composition of the school attended (Rutter *et al*, 1969; Willms, 1986; Lee, 1986; Raudenbush and Bryk, 1986, 1987), but others have concluded that the existence for a substantial relationship is weak (cf. Bachman and O'Malley, 1978).[1] Another set of studies have found substantial relationships among a range of variables that measure the process characteristics of schools (Rutter *et al*, 1979; Brookover and Lezotte, 1979). However, only one study to my knowledge has investigated the relationship of compositional characteristics to process characteristics (Alexander *et al*, 1979). Although many studies have alluded to numerous potential processes that might explicate the ways in which such effects may influence pupil performance, there has been a general neglect of the need to define and investigate the social and pegagogical processes through which composition effects may influence pupil attainment. Almost all studies have focused on the empirical evidence for the influence of school composition as measured by the mean of particular social and ethnic or racial characteristics of pupil background; Brown and Saks (1981) being the only published study to have moved beyond this.

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[1]The Bachman & O'Malley study highlights the problem of censoring in the reporting of negative findings. Their study analysed both the Youth in Transition data and the National Longitudinal Study of 1972 data, but concluded that there was only weak evidence for the influence of mean SES on pupil attainment.. A leading journal rejected the paper, citing the null findings as the main reason for this.

In general, British research, has had more ready access, than that in North America, to information on pupils' prior cognitive attainments and has included this in the evaluation of compositional influences which might be attributable to school intake, but there has been little attempt to resolve the conceptual problems posed by the collinearity between school-level measures of prior attainment and SES. That is, how should either or both be interpreted.

Hauser (1970) suggested that the validity of studies which attribute the influence of intake composition to social or pedagogic processes that take place in the school may be particularly susceptible to processes of selection which determine the allocation of pupils to schools. He argued that the characteristics of school intakes could themselves be directly interpreted as evidence of social selection processes in society at large, which channel different types of pupils into different schools. In a system of schooling which prescribes a territorial catchment area unique to each school such processes are still likely to operate because of the selection processes influencing patterns of residential settlement in modern societies. Even if research can demonstrate a relationship between the characteristics of school intakes and social-psychological processes operating within schools, or between these and particular pedagogical practices which vary across schools, Hauser's position poses a challenge to all arguments which seek to attribute an independent influence to school composition as one of the determinants of pupil attainment. Compositional characteristics of schools may also be no more than a proxy for errors of measurement in the individual-level measures of pupil background and prior attainment.

Hauser's arguments lead us to take seriously the distinction between the compositional properties of school intakes that are merely masquerading as unmeasured selection effects versus the conceptualisation of them as second order ontological entities

invoked through the contextualisation of the school environment. The notion of context implies that pupils and/or teachers respond to the compositional properties of school intakes *qua* group properties, rather than as properties of pupils as individuals. This contextualisation may be set within a framework that includes an interaction between pupil-level characteristics and context (Raudenbush and Bryk, 1987) or in a dynamic framework in which pupils as individuals and context reciprocally influence each other (Erbring and Young, 1979).

In an attempt to explicate some of the general theoretical notions invoked as mediators of potential compositional effects within schools Erbring and Young (1979) developed a range of analytic models of potential processes. They argued that the standard *contextual effects* model suffers from the weakness of implying a direct relationship between aggregate characteristics of school composition and pupil attainment. They refer to this model as the *social telepathy* model of contextual effects because of its failure to link the macro social context to the micro social environment of individual action. They suggest four further models of processes which might mediate the influence of context. These are: (1) the common-fate model of indirect effects, (2) the social norms model of context, (3) the common-fate model of spurious effects, and (4) the feedback model of interactive effects between pupils in a given context.[2] Only the common-fate model of indirect effects, the social norms model, and the feedback model attempt to explicate the influence of context in terms of processes which operate at the micro-level (pupil-level) within schools. The common-fate model of spurious effects encompasses Hauser's arguments noted earlier, but it also indicates the potential for other processes operating between schooling and other social institutions to have effects which are related to the composition of school intakes, even though such

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[2] Figures 5.1 and 5.2 (chapter 5) show examples for each of these models.

processes may not be attributable to particular social-psychological or pedagogic processes in the teaching and learning context.

There have been few attempts to pursue the implications of Erbring and Young's arguments, which imply the need to conduct studies of intra-school processes at the micro-level and relate these to macro-level features of school context as it is measured by school process and compositional characteristics of schools. Two studies which have attempted to unravel the relationship between the macro features of context and school processes are Rutter *et al* (1979) and Alexander *et al* (1979). The Rutter study reported a substantial relationship between school process and two aspects of school context, 'academic balance', and 'behavioural balance'. They found lower relationships between 'occupational balance' and 'ethnic balance' with the overall process score. These findings suggest that the data from this study may have further potential for exploring the relationship between more disaggregated aspects of school process and the compositional characteristics of schools. The study by Alexander *et al* (1979) also found a high correlation between various aspects of intra-school processes and compositional characteristics measured by the mean socio-economic status and racial balance of school intake. However, the high degree of collinearity in this data meant that it was not possible to disentangle the nature of the causal relationships between context and processes across schools.

Structure among the school process measures

As indicated in chapter 6 the measures available to the present study represent a partial and uneven coverage of the conceptual domains that the literature suggests would constitute a comprehensive model of school process as it relates to the mean attainment of schools. The analyses that follow of the structure within the set of measures available are therefore primarily of an empirical nature. However, the items available are first classified

into a set of categories that are based on the four analytical models proposed by Erbring and Young (1979) and on three further frameworks that have been found by others to be associated with the mean attainment of schools . The seven frameworks employed in classifying the items are: (1) Erbring and Young's common fate indirect effects model, (2) Erbring and Young's social norms context model, (3) Erbring and Young's common fate model of spurious effects, (4) a pupil evaluation framework, (5) a disciplinary climate framework, (6) an instructional methods framework, and (7) an instructional environment framework. The last four of these frameworks owe their heritage to no established theoretical models of school process, although they each draw on a range of conceptual and empirical findings of factors that have been found in other research to be related to the mean attainment of schools. Since the process information in this study is used in an exploratory context it is more appropriate to think of the seven frameworks noted above as an initial methodological device for reducing the data to more manageable proportions.

These frameworks were employed as a means of guiding the selection of items for entry into a set of exploratory factor analyses of the structure of relationships between them. A factor analysis was run for the sets of variables that were classified as members of each of these frameworks. Varimax rotation was employed as a means of creating a factor structure in which factors were relatively orthogonal to each other, and the regression method was then employed to build a set of factor scores based on each of these rotated factor analyses. The seven sets of factors, one for each of the frameworks above, however, will not be uncorrelated with each other as they were conducted independently of each other, and moreover, many items were classified as belonging to more than one framework. The main purpose of the factor analysis was to construct a set of school process indicators that were each more reliable than the individual items in the data. This objective was achieved by deriving factor scores that were based on the common variation between several items.

Table 7.1 presents a list of the constructs derived from the analysis and provides each with a descriptive label. This table also groups the derived constructs into a new typological framework which can be thought of as a higher order conceptual structure underlying the constructs. Its purpose is to provide a heuristic interpretative structure for the set of constructs, and it represents only one of a wide range of alternative frameworks that might be applied to impose conceptual order in this situation. The first of the major classifications that describe the constructs have been labelled Instructional Factors, of which the subclasses of constructs are: *classroom pedagogy, homework/extra teaching,* and *truanting behaviour.*[3] The latter subclass of constructs is placed here under instructional factors because of its salience to recent arguments that the amount of exposure to the curriculum and time spent learning the examined material is a significant correlate of pupil attainment (Anderson, 1987). The second major classification has been labelled Pastoral Support/Advice for which the subclasses of constructs are labelled: *teacher encouragement/support, teacher pastoral advice,* and *teacher advice relating to jobs and careers.* The third major classification of constructs is labelled Influence of Significant Others for which there are three subclasses of constructs: *teachers, parents, and peers.* The fourth major classification of constructs has been labelled Social Outcomes of Schooling, for which there are two subclasses of constructs: *school was worthwhile and enjoyable,* and *school presented an opportunity to learn social skills.*

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[3] Note that 'truanting behaviour' is positively coded, so that a high score implies a low level of truanting in the school.

Table 7.1 Constructs derived from a factor analysis of the questionnaire items

Instructional Factors

- *Classroom Pedagogy*
  - INSTR1 Classroom processes
  - INSTR2 Teaching methods - academic orientation
  - INSTR3 Good teacher
- *Homework/Extra Teaching*
  - INSTR4 Homework - whether set
  - INSTR5 Homework - amount (1)
  - INSTR6 Homework - amount (2)
  - INSTR7 Homework - allowed to take textbooks home
  - INSTR8 Extra teaching by family (1)
  - INSTR9 Extra teaching by family (2)
  - INSTR10 Extra teaching by teachers
  - INSTR11 Extra teaching by paid tutor (1)
  - INSTR12 Extra teaching by paid tutor (2)
  - INSTR13 Extra teaching by someone else
- *Truanting Behaviour*
  - INSTR14 Truanted - primary to S2
  - INSTR15 Truanted - S2 to S4

Pastoral Advice

- *Teacher Encouragement/Support*
  - ADVICE1 School work encouraged
  - ADVICE2 Teacher helpfulness
- *Teacher Pastoral Advice*
  - ADVICE3 Teacher advice 1
  - ADVICE4 Teacher advice 2
  - ADVICE5 Teachers' helpful in personal matters
- *Teacher Advice Relating to Jobs and Careers*
  - ADVICE6 Teacher advice re jobs/careers
- *Miscellaneous*
  - MISC1 Well known to teacher

Influence of Significant Others

- *Teachers*
  - SIGOTHR1 Perceived teacher support for pupil 1
  - SIGOTHR2 Perceived teacher support for pupil 2
  - SIGOTHR3 Teachers supportive
  - SIGOTHR4 Teacher support for staying-on
- *Parents*
  - SIGOTHR5 Parent's wanted me to leave
- *Peers*
  - SIGOTHR6 My friends took school seriously

Social Outcomes of Schooling

- *School was worthwhile and enjoyable*
  - SOCIAL1 School worthwhile
  - SOCIAL2 Schoolwork worthwhile
  - SOCIAL3 Enjoyed 4th year
  - SOCIAL4 Enjoyed last year at school
  - SOCIAL5 Teachers were always picking on me
- *Opportunity to Learn Social Skills*
  - SOCIAL6 Opportunity to learn social skills (1)
  - SOCIAL7 Opportunity to learn social skills (2)

In some cases two or more constructs within these subclassifications have been given similar descriptive labels. This reflects the communality of the set of items that provide the largest contribution to these constructs. Their duplication arises from the inclusion of items in more than one of the factor analyses based on the frameworks discussed above. The correlations between these pairs of similarly described items are all high (table 7.2) and they can, in general, be interpreted as alternative representations of the same underlying empirical constructs. This provides one basis on which the dimensionallity of the construct space can be reduced.

As a means of exploring the potential of the derived factor constructs to explain the variation in mean attainment between schools a correlational analysis between them and the estimates of the mean attainment of schools was conducted. The estimates of the mean attainment of schools employed here are unadjusted for school intakes, which is equivalent to specifying a model in which pupil-level covariates are centred about their within-school means. That is, the estimates of mean attainment in each school are unadjusted for any between-school variation in factors that might be responsible for variation among schools in their mean attainment. In this exploratory part of the study this seemed appropriate because, a model in which the background covariates were uncentred would have resulted in estimates which had been purged of between-school variation associated with the variation among schools in the average characteristics of their intakes. School effects associated with the intake characteristics of schools are often referred to as context effects, but there is much dispute as to whether they are proxy measures for selection effects or school process factors.

Table 7.2 Correlations among subsets of the school process constructs

Instructional Factors

	MEANSCE	MEANENGL	MEANARIT	INSTR1	INSTR2	INSTR3	INSTR4	INSTR7	INSTR8
INSTR1	.359	.212	.348	1.000					
INSTR2	.401	.289	.393	.867	1.000				
INSTR3	.345	.226	.370	.713	.557	1.000			
INSTR4	.231	.280	.255	.121	.506	.109	1.000		
INSTR5	.140	.062	.095	-0.024	.104	-0.053	.055	1.000	
INSTR6	.124	.069	.086	-0.152	.039	-0.075	.125	.876	1.000
INSTR7	.086	.162	.110	.092	.247	.035	.017	.071	.140
INSTR8	.122	.099	.115	.090	.080	.065	.064	.184	.059
INSTR9	.115	.115	.125	.110	.065	.026	-.045	.080	.032
INSTR10	.305	.178	.251	.044	-.011	.065	.045	.065	.011
INSTR11	.209	.113	.159	.024	-.028	.036	.033	.079	.034
INSTR12	-.007	-.001	-.020	.036	.043	.064	.070	.148	.021
INSTR13	.155	.091	.151	-.051	-.012	-.064	.078	.031	.006
INSTR14	.115	.111	.117	.006	.044	.095	.126	-.006	.045
INSTR15	.341	.175	.343	.234	.243	.203	.069	.008	-.005

	INSTR7	INSTR8	INSTR9	INSTR10	INSTR11	INSTR12	INSTR13	INSTR14	INSTR15
INSTR7	1.000								
INSTR8	-.040	1.000							
INSTR9	-.057	.519	1.000						
INSTR10	.063	.104	.008	1.000					
INSTR11	.070	.021	-.028	.983	1.000				
INSTR12	-.022	.799	.030	.017	-.029	1.000			
INSTR13	-.038	.279	-.016	-.005	-.088	.014	1.000		
INSTR14	-.027	-.008	-.054	.077	.074	.001	.008	1.000	
INSTR15	.012	-.024	-.013	.097	.077	-.006	-.067	.062	1.000

Pastoral Advice

	MEANSCE	MEANENGL	MEANARIT	ADVICE1	ADVICE2	ADVICE3	ADVICE4	ADVICE5	ADVICE6	MISC1
ADVICE1	.514	.246	.458	1.000						
ADVICE2	-.081	-.116	-.050	.026	1.000					
ADVICE3	-.099	-.183	-.133	.032	.009	1.000				
ADVICE4	-.055	-.149	-.089	.058	-.012	.993	1.000			
ADVICE5	.149	.082	.166	.021	.097	.074	.067	1.000		
ADVICE6	-.216	-.230	-.196	-.061	.860	.103	.052	.206	1.000	
MISC1	.112	.061	.122	.060	.059	-.028	.022	.045	-.103	1.000

(table 7.2 continued)

Influence of Significant Others

	MEANSCE	MEANENGL	MEANARIT	SIGOTHR1	SIGOTHR2	SIGOTHR3	SIGOTHR4	SIGOTHR5	SIGOTHR6
SIGOTHR1	-.040	.013	-.011	1.000					
SIGOTHR2	-.053	-.007	-.022	.981	1.000				
SIGOTHR3	-.044	-.017	-.015	.969	.976	1.000			
SIGOTHR4	.549	.291	.500	.112	.039	.098	1.000		
SIGOTHR5	.644	.417	.600	.022	-.013	.019	.696	1.000	
SIGOTHR6	.418	.313	.401	.128	.110	.139	.375	.422	1.000

Social Outcomes of Schooling

	MEANSCE	MEANENGL	MEANARIT	SOCIAL1	SOCIAL2	SOCIAL3	SOCIAL4	SOCIAL5	SOCIAL6	SOCIAL7
SOCIAL1	.551	.420	.557	1.000						
SOCIAL2	.293	.235	.304	.700	1.000					
SOCIAL3	-.050	.020	-.016	-.023	-.015	1.000				
SOCIAL4	.105	-.010	.103	.071	-.012	.126	1.000			
SOCIAL5	.025	.018	.051	.190	.209	-.012	.265	1.000		
SOCIAL6	.045	.143	.063	.061	.057	-.044	-.111	.064	1.000	
SOCIAL7	.020	.123	.036	.045	.044	-.051	-.120	.051	.996	1.000

See table 7.1 for a description of the school process constructs and their labels. The estimates of mean attainment are: MEANSCE estimate for overall SCE measure, MEANENGL, estimate for fourth year English; MEANARIT, estimate for fourth year arithmetic outcome.

Correlations for constructs within eleven of the twelve sub-classifications in table 7.1 are presented in table 7.2, and their correlations with mean attainment are shown in table 7.3. The remaining sub-classification represents a miscellaneous category which is of no substantive interest and which has trivial correlations with almost all other constructs.

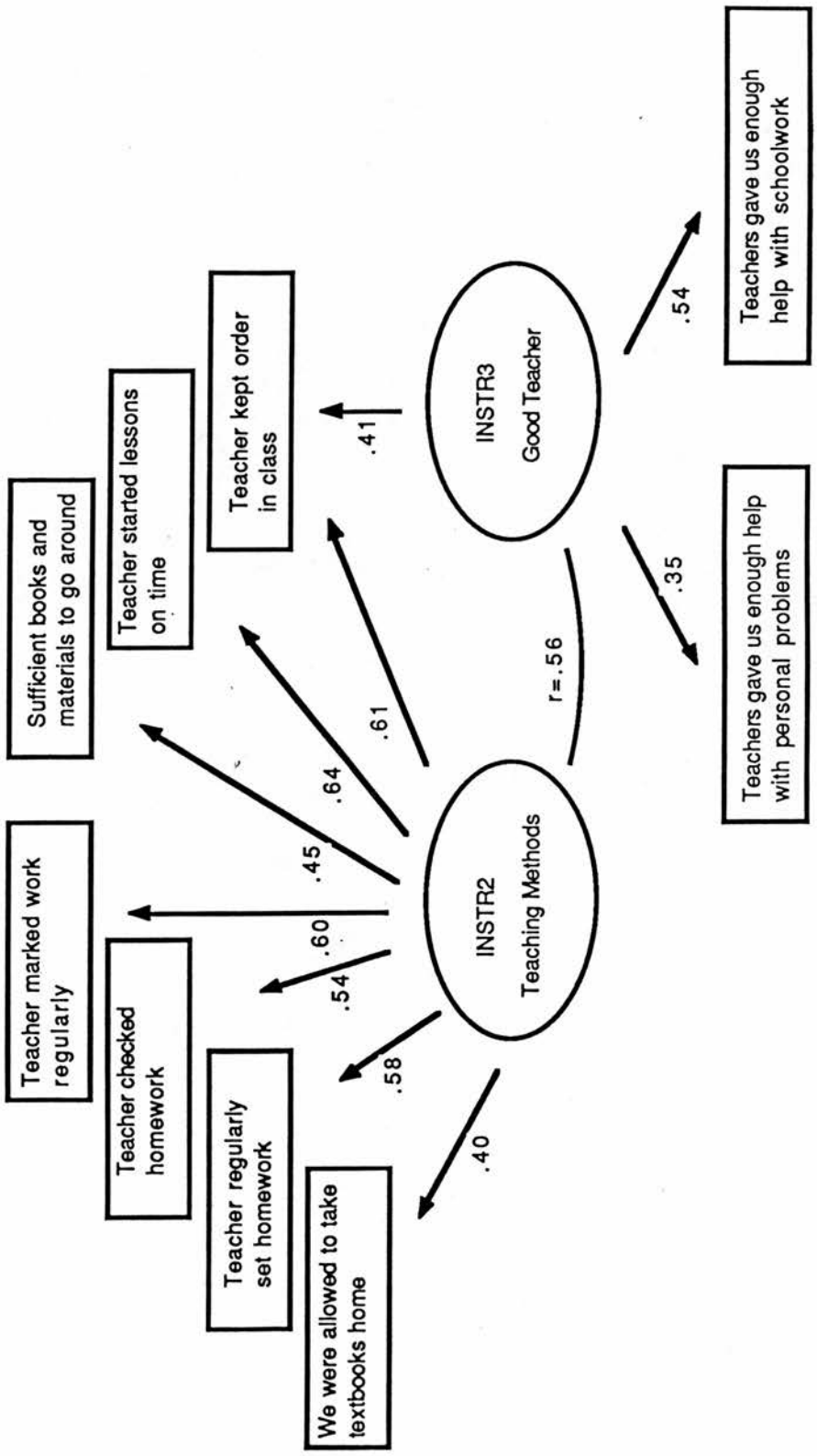
The correlations between the three instructional factors labelled *classroom pedagogy* are all high. Figure 7.1 illustrates the relationships of the items to two of these derived constructs, and the relationships among the constructs. The items from which the constructs of *classroom process* and *teaching methods- academic orientation* are derived share a common core of items, thus it is unsurprising that they are highly correlated. The third construct in this group, *good teacher*, also shares an item which is common to both the other constructs: 'teacher kept order in class'. Most of the items from which the first two of these constructs were derived were asked with specific reference to pupil's fourth year English lessons, however, their correlations with the estimates of mean attainment for the overall SCE measure and for arithmetic are as high or higher. This suggests that the items are tapping some more general dimension of classroom process, or that there was cross-fertilisation of pupils' recollections of experiences in English lessons with their experiences in other lessons.

Table 7.3 Correlations between estimates of mean attainment, compositional characteristics of schools, and school process constructs

	MEANSCE	MEANENGL	MEANARIT	MEANSES* (Mean of SES)	LGSDSES (Log of SES)	SKEWSES (Skewness of SES)	KURTSES (Kurtosis of SES)
MEANSCE	1.000						
MEANENGL	.624	1.000					
MEANARIT	.912	.705	1.000				
MEANSES	.820	.464	.765	1.000			
LGSDSES	.550	.500	.538	.609	1.000		
SKEWSES	-.527	-.213	-.461	-.639	-.221	1.000	
KURTSES	-.518	-.501	-.525	-.562	-.747	.465	1.000
INSTR1	.349	.199	.338	.316	.146	-.229	-.110
INSTR2	.386	.273	.378	.317	.116	-.258	-.126
INSTR3	.344	.225	.371	.313	.105	-.231	-.103
INSTR4	.212	.264	.236	.179	.080	-.165	-.137
INSTR5	.145	.065	.098	.189	.016	-.219	-.027
INSTR6	.132	.076	.093	.175	.024	-.195	-.052
INSTR7	.082	.162	.109	.019	-.039	-.024	.021
INSTR10	-.015	-.010	-.028	-.038	-.166	-.126	.179
INSTR15	.338	.167	.340	.330	.107	-.197	-.118
ADVICE1	.510	.238	.457	.483	.309	-.278	-.251
ADVICE2	-.065	-.102	-.033	-.083	-.137	.042	.127
ADVICE3	-.103	-.185	-.134	-.153	-.133	.081	.122
ADVICE4	-.062	-.154	-.093	-.112	-.109	.060	.105
ADVICE5	.172	.100	.188	.124	-.050	-.128	-.042
ADVICE6	-.194	-.210	-.173	-.232	-.237	.126	.211
MISC1	.082	.032	.094	.087	-.021	-.038	.014
SIGOTHR1	-.040	.013	-.011	-.091	-.106	-.003	.058
SIGOTHR2	-.053	-.007	-.022	-.100	-.122	-.003	.066
SIGOTHR3	-.044	-.017	-.015	-.085	-.132	-.004	.075
SIGOTHR4	.549	.291	.500	.504	.297	-.308	-.255
SIGOTHR6	.418	.313	.401	.387	.211	-.250	-.229
SOCIAL1	.547	.417	.556	.496	.437	-.214	-.338
SOCIAL2	.288	.232	.302	.250	.207	-.137	-.159
SOCIAL3	-.055	.017	-.018	-.057	-.101	-.077	.050
SOCIAL4	.103	-.012	.102	.104	-.000	-.115	-.026
SOCIAL5	.019	.014	.048	.035	-.027	.022	.060
SOCIAL6	.051	.147	.066	.049	.136	.028	-.150
SOCIAL7	.026	.129	.039	.025	.125	.039	-.137
INSTR8	.125	.100	.118	.145	.032	-.189	.002
INSTR9	.127	.122	.136	.140	.168	-.051	-.159
INSTR11	.240	.141	.193	.355	.198	-.274	-.165
INSTR12	.334	.204	.284	.446	.264	-.324	-.220
INSTR13	.154	.089	.150	.173	.147	-.101	-.097
INSTR14	.123	.119	.126	.113	.082	-.105	-.112
SIGOTHR5	.644	.417	.600	.603	.397	-.344	-.360

* See tables 7.1 and 7.2 for a description of the labels for the process constructs and the estimates of mean attainment.

Figure 7.1 Illustration of Construct Loadings and Correlations Between Constructs



The correlations among the ten constructs included under the category of *homework/extra teaching* are dominated by three high values which reflect a significant degree of communality of items among the pairs of constructs involved in each case. The first pair of constructs share three items relating to the amount of homework set by teachers and the amount done by the pupil, while the second pair share an item indicating that the pupil received 'extra teaching by a paid tutor'. There is also a triplet set of relatively high correlations between constructs which share items that reflect extra teaching by a family member and by teachers, respectively. The correlations among the three constructs involved are: .52, .80, .03. The low value of the last of these coefficients is due to the fact that two of the constructs emanate from the same factor analyses, and since the factor scores were specified to be orthogonal within each analysis their correlation is near zero. The correlation between this pair of constructs and the third from another factor analysis model thus reflects disjoint covariation, that is they covary with unique and statistically independent parts of the variation contained within the third construct. Thus, this cluster of high correlations does not provide a chance for further reduction in the dimensionallity of the construct space.

The two other high correlations discussed above do, however, suggest that the construct space could be reduced by withdrawing one member of each of the pairs of constructs involved. The correlations between the constructs under this subclass have lower correlations with the estimates of mean attainment than those under the previous subclass, which were all in the range .21 to .40. The highest correlation between any of these constructs and the estimates of mean attainment is .31, with only three of the ten constructs having intercorrelations of greater then .20 with mean attainment. These three constructs are labelled *homework - whether set* and the two constructs based on *extra teaching by a paid tutor.* The remaining constructs that had correlations of less than .2 with mean attainment were:

homework- amount done, homework - allowed to take textbooks home, extra teaching - by family member, extra teaching - by teachers, extra teaching - by anyone else.

Only one of the two constructs that relate to pupil *truanting behaviour* has a moderate correlation with mean attainment. The construct measuring truanting behaviour in the last three years of compulsory schooling, *truant - S2 to S4* , has correlations of .34 with mean attainment on the overall SCE measure, and the arithmetic outcome, but only .18 with the English outcome. The construct that was based on measures of truanting in primary school and the first two years of secondary school, *truant - primary to S2*, has correlations of the order of .11 with the three estimates of mean attainment.

The construct labelled *school work encouraged* under the subclass *teacher encouragement/support* has correlations of .25 to .51 with the estimates of mean attainment, but the other construct under this subclass, *teacher helpfulness* has correlations of less than .11 with the estimates of mean attainment. The two *teacher pastoral advice* constructs labelled *teacher advice* are highly correlated with each other as they share a common core of the same four main items Neither of these constructs nor the other in this subclass, *teachers helpful in personal matters,* has a correlation with any of the three estimates of mean attainment that is greater than .2. The construct *teacher advice relating to jobs and careers* has a correlation of about .2 with each of the estimates of mean attainment.

The class of constructs labelled Influence of Significant Others contains subclasses relating to the influence of teachers, parents, and peers. The three constructs under the subclass of *teachers* all share a core of items which accounts for the high intercorrelation of one of them with the other two. The other two are derived from the same factor model, and are therefore orthogonal. The two constructs

relating to *perceived teacher support of pupil* have correlations with mean attainment that are all less than .05, while the third, *teacher support for staying-on* has correlations greater than .50 with two of the estimates of mean attainment and .29 with the other. The subclasses of *parents* and *peers* both contain one construct each. The construct relating to the influence of parents, *parents wanted me to leave (at end of fourth year)*, has correlations greater than .40 with all three estimates of mean attainment, while that relating to peers, *my friends took school seriously*, has correlations greater than .31 with each of the three estimates of mean attainment.

The constructs labelled as Social Outcomes of Schooling are grouped into two subclasses, *school was worthwhile and enjoyable*, and *school provided an opportunity to learn social skills*. The former subclass contains two constructs *school worthwhile* and *schoolwork worthwhile* that share a common core of items and are highly correlated. The first of these constructs has correlations of .23 to .30 with the three estimates of mean attainment, while they range from .42 to .56 for the second of these two constructs. The other two constructs in this subclass, *enjoyed fourth year*, and *enjoyed last year at school*, have correlations which are less than .11 with each of the estimates of mean attainment. The two constructs within the subclass labelled *school provided an opportunity to learn social skills* have correlations with the estimates of mean attainment that are all less than .14.

As indicated earlier these school process indicators describe a range of features of schools that may be related to mean attainment, but their coverage of the conceptual domains that one would wish to investigate in a planned study is uneven and unrepresentative. This must be recognised in interpreting the interpretative structure that has been developed above. The factor analyses could only suggest constructs that are distinct given the data available. A more fully representative information structure may suggest a quite different pattern of relationships between the variables in a complete

theoretical model, and more importantly, between the set of variables that have been analysed above. Given the data available, the eleven constructs that have correlations of the order of .3 or greater with the estimates of mean attainment suggest that variation in the following characteristics of schools are related to variation in the estimates of school mean attainment.

The first set of constructs that are related to mean attainment are those associated with Instructional Factors. All three of the *classroom pedagogy* constructs are related to mean attainment. These three constructs are themselves closely interrelated (two sharing a common core of items), with correlations between them all higher than .55. Among the *homework/extra teaching* constructs only one relating to the pupil receiving *extra teaching from a paid tutor* is related to the estimates of school mean attainment. The construct of *truanting behaviour* that relates to truanting in the last two years of compulsory schooling is also related to the mean attainment of schools. This construct is based on pupil-level measures of the frequency of truanting during this period. Thus schools that experience higher rates of truancy are likely to also be those with the lower estimates of mean attainment. Among the Pastoral Advice constructs only that relating to the *teachers encouragement* to do good school work has a consistent relationship to the estimates of mean attainment. There are three constructs related to the Influence of Significant Others that are strongly related to mean attainment. These are:*teacher support for staying-on, parent's wanted me to leave (at end of fourth year),* and *my friends took school seriously.* With one or two exceptions the correlations between these constructs and the three estimates of mean attainment are higher than 40. Two closely interrelated constructs describing the Social Outcomes of Schooling are related to the estimates of mean attainment. These both relate to whether or not the pupil thought that school was a *worthwhile* experience.

In total, eleven of the process constructs show a consistent relationship to all three of the estimates of mean attainment, but it is salient to note that the other twenty-three had correlations with the estimates of mean attainment that were in most cases less than .10. All of the constructs that relate to the structure of advice and pastoral relationships between pupils and teachers were among this latter group. Also, the constructs relating to the amount of homework done had only a weak relationship to the estimates of mean attainment. The construct that indicated that teachers set homework, however, had correlations in the range .23 to .28 with the estimates of mean attainment. The other items that also contributed to this construct were those indicating that the teacher regularly marked the pupil's work, and that they checked homework. This construct will be retained along with the eleven that had correlations greater than .30 with the estimates of mean attainment for the analysis of variation between sectors in chapters 10 and 11. In these chapters the school process constructs will be employed in an exploratory mode of analysis as a means of attempting to explain variation in attainment among sectors. The analyses in chapter 12, however, will focus more explicitly on the relationship between school process and school composition in the context of multivariate models of variation in attainment among schools, and the models developed there will again consider the full set of school process constructs developed earlier in this chapter. Table 7.4 presents a summary correlation matrix for the estimates of mean attainment with these twelve process measures.

Table 7.4 Summary of strongest correlations between process constructs, compositional characteristics of schools, and estimates of mean attainment

	MEANSCE	MEANENGL	MEANARIT	MNSES	LGSDSES	SKSES	KUSES
MEANSCE	1.000	.624	.912	.820	.550	-.527	-.518
MEANENGL		1.000	.705	.464	.500	-.213	-.510
MEANARIT			1.000	.765	.538	-.461	-.525
INSTR1	.349	.199	.338	.316	.146	-.229	-.110
INSTR2	.386	.273	.378	.317	.116	-.258	-.126
INSTR3	.344	.225	.371	.313	.105	-.231	-.103
INSTR4	.212	.264	.236	.179	.080	-.165	-.137
INSTR12	.334	.204	.284	.446	.264	-.324	-.220
INSTR15	.338	.167	.340	.330	.107	-.197	-.118
ADVICE1	.510	.238	.457	.483	.309	-.278	-.251
SIGOTHR4	.549	.291	.500	.504	.297	-.308	-.255
SIGOTHR5	.644	.417	.600	.603	.397	-.344	-.360
SIGOTHR6	.418	.313	.401	.387	.211	-.250	-.229
SOCIAL1	.547	.417	.556	.496	.437	-.214	-.338
SOCIAL2	.288	.232	.302	.250	.207	-.137	-.159

The relationship of school process to school composition

The preceding section has analysed the relationship of a set of school process constructs to the estimates of mean attainment. A full mutivariate analysis of the relationship between school process, school composition, and attainment will be presented in chapter 12. In this section the analysis will focus on the relationship between school process factors and school composition.

As discussed earlier in this chapter, there is a debate in the literature about the interpretation of the widely reported association between the average social class of school intakes and the attainment of pupils (Erbring and Young, 1979). Few studies have attempted to unravel the relationship between school process and school composition, and the data available to the present study are far from ideal for the purpose. Nevertheless, they may be able to shed some light on the skeleton of the relationship. Only Brown and Saks (1981) have conceptualised the distribution of school intakes in terms other than measures of their central tendency. All other studies have employed either direct measures of central tendency such as the mean of the distribution, or have employed indirect measures based on the notion of *balance* (Rutter *et al*, 1979). Although there has been little explicit discussion in the literature of the theoretical basis for the concept of balance, it implies a fulcrum or point about which the distribution pivots. Measures of balance have not been based on an explicit rationale of where the fulcrum lies, or what constitutes its essential substantive nature.

Recent research on the use of grouping in instructional settings (Barr and Dreeben, 1983; Dreeben and Barr,1987; Hallinan, 1985; Hallinan and Sorensen, 1983; Eder, 1981, 1982; Gamoran, 1986; Rowan and Miracle, 1983) has suggested that the distribution of pupils within instructional settings is related both to the instructional methods employed by teachers, and to the attainment of pupils. These studies are based on a conceptualisation of the

instructional process as one in which learning is determined by the rate of coverage of curricula materials and the adaptation of the instructional practices to individual differences. One of the findings from this recent research is that teachers attempt to deal with diversity in the instructional setting by grouping pupils on the basis of their rates of learning and through the adaptation of practices and instructional materials to the characteristics and capabilities of these groups (Barr and Dreeben, 1983; Dreeben and Barr,1987). Arguments from a different perspective, but supporting the need to reduce diversity in order to maximise pupil learning, lie behind the widespread instructional and curriculum practices of setting and streaming. In this context it is also salient to recognise that pupils entering schools are *grouped* through social selection processes that determine residential patterns in modern societies.

Coleman Hoffer and Kilgore (1983) found that there was evidence that the skewness of the behavioural characteristics of pupils in schools was related to the mean attainment of schools. Unfortunately, the data available to the present study do not indicate the instructional groups that pupils were taught in, only the schools that they attended. As Erbring and Young (1979) indicated, the distribution of pupils within schools may influence pupil learning through at least four channels. They may influence the social-psychological context in which pupils interact, and thereby indirectly influence learning. The instructional practices of teachers may be adapted in various ways to the diversity of pupils in classes, thus directly influencing pupil learning. The context of schools may have external effects that influence the types of teachers, etc, that schools receive, thereby having an indirect influence on pupil learning. Finally, they may reflect differences in the learning potential of pupils that attend schools, that is, they may represent otherwise unmeasured selection effects.

It is important to attempt to ascertain the relationship between the compositional characteristics of schools, school processes, and

other features of the learning environment. The analysis presented below measures school intake characteristics as the mean, the logarithm of the standard deviation,[4] the skewness, and the kurtosis of the social class distribution of school intakes. These four measures are employed as a means of expanding the usual conceptualisation of diversity in school intakes. The objective of the analysis is to test the proposition that these measures of the intake composition of schools represent variation that is independent of variation in school processes. If only a minor proportion of the variation in intakes is conjoint variation with school processes then this would favour interpretations of school composition that view it as a proxy for unmeasured selection effects. If, however, the covariation between the two features of schools is high then it is more probable that the effects that have often been attributed to school context are proxies for the influence of school processes. This would then have an important implication for models of school effectiveness. In particular, it would have implications for the direction of the change in estimates of the effectiveness of schools and school sectors before and after the addition of measures of school composition to the model.

If school compositional characteristics reflect unmeasured educative potentials of pupils, then an increase in the estimate of the effectiveness of schools, or sectors, subsequent to their inclusion in the model would imply that the naive model that omitted compositional characteristics underestimates the true effectiveness of schools. However, if the compositional characteristics are proxies for the processes that take place in schools, then the increase in the estimates of the effectiveness of schools, or sectors, subsequent to their inclusion in the model would indicate that the change in the estimate was associated with the efficacy of school

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[4]The logarithm of the standard deviation is employed in place of the standard deviation or the variance of the distribution because it has better variance stabilising properties than these alternative measures.

processes that determine pupil attainment. Thus, schools, or sectors, for which there is an increase in the estimate of effectiveness subsequent to the inclusion of compositional characteristics into the model would be schools in which the performance of pupils is being inhibited by unfavourable school processes and learning conditions. The increase in the estimate of effectiveness would then indicate the level of attainment that could be expected if the school processes and learning conditions were on a par with those in other schools. Thus, the interpretation of the compositional characteristics of schools raises a paradox. Either they are proxies for unmeasured selection effects, in which case they should be included in models of school effectiveness so that schools are judged from a more equal vantage point, or they are proxies for school related processes, in which case their inclusion in the model would distract from the positive effects that schools have on the attainments of their pupils. The importance of the theoretical dilemma posed by this paradox is readily seen from a recent analysis of data on Scottish schooling. McPherson and Willms (1986) reported that the estimates of the advantage that they found for Catholic schools, over non-denominational schools, was substantially increased when the average social class of schools was incorporated into the model. They interpreted this as indicating that the Catholic schools concerned were even more effective than indicated by the naive model that omits these compositional effects. This interpretation is based on the argument that the compositional effect

> "for each school is not essential to the identity of the school, but stands externally to it in a relationship to the school which should be statistically adjusted when assessing the effectiveness of the school *ceteris paribus*; it is 'other' than the school, and should be 'made equal' statistically." (McPherson and Willms, 1986, pp250).

Table 7.5 Multiple Correlations between school compositional characteristics and school process constructs

Process Construct Classification	School Social Class Intake Compositional Characteristic			
	Mean	Log Std Dev	Skew	Kurtosis
Instructional Factors	.48	.16	.36	.19
Pastoral Advice	.62	.42	.35	.36
Influence of Significant Others	.60	.38	.36	.33
All school based process constructs	.73	.56	.48	.45
Non-school based process constructs	.71	.51	.47	.47
School + Non-school constructs	.80	.61	.53	.52

The discussion in chapters 10 - 12 returns to this issue of the interpretation of effects associated with school composition, in the context of models that also include measures of school process.

Table 7.3 reported the zero-order correlations between the process constructs and the four measures of the intake distribution of schools while table 7.5 presents the multiple correlations between these measures of school composition and the four main classifications of school-level process constructs developed in the preceding section. The process constructs that relate to non-school processes (extra teaching by family, paid tutor, or others; truanted - primary to S2; parents wanted me to leave) have been combined into a separate group in this analysis.

The analyses focuses principally on the multiple correlations, and the zero-order correlations are only referred to in the discussion of the contribution of individual constructs to the multiple correlations. The largest multiple correlations are those between the mean social class of school intakes and the process constructs. The multiple correlations are in the range .48-.80 for all such relationships. The relationships between the other characteristics of intake distributions and process constructs are in the range .16-.61, and are generally less consistent across sets of process constructs.[5] Thus, overall the school process constructs are more

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[5] A parallel problem to the estimation of variance components to that which arises in the estimation of school means and slopes occurs in this analysis. The present analysis assumes that the estimates of compositional characteristics of schools are fixed values, and therefore that they are known with certainty. In fact, they are each subject to sampling variability. The present analysis does not take account of this source of variation in the measures of the distributional characteristics of schools, hence, it must be subject to the caveat that were the proportions of sampling variability to vary substantially across the four measures of school composition then the estimates of the multiple correlations would not be comparable for the present purposes. Instead, the appropriate comparison would involve the proportion of variation that was associated with the *parameter* variance in the measures of school composition, ie the multiple correlation would be between the school process constructs and the *true score* for the intake composition measure. As far as I am

closely related to the mean of school intakes than to other features of the within-school variation of the intake distributions. All intake distributional characteristics are more highly related to the process constructs that were designated as non-school factors than to any of the three school based classes of process constructs. The multiple correlation between the non-school constructs and the intake characteristics was dominated by a single construct *parent's wanted me to leave (at end of fourth year)* . This construct has a zero order correlation in the range 34 - .60 with the compositional characteristics, except for the measure of skewness in the intake distribution, for which the construct *extra teaching by a paid tutor* has a higher zero order correlation (r = .22 to .45 in magnitude). Thus, insofar as intake compositional characteristics are potentially indicators of unmeasured selection effects, it would appear that such effects may be related to the educational expectations and aspirations of families.[6] The negative relationship between skewness and *extra teaching by a paid tutor* indicates that pupils are more likely to seek such assistance in schools that have a negative skewness in their intake distribution.

The multiple correlation between school process constructs that relate to Instructional Factors and intake characteristics are lower than those that relate to Pastoral Advice, Influence of Significant Others, and the Social Outcomes of Schooling. The constructs relating to the Influence of Significant Others have the strongest multiple correlations with the intake characteristics. The construct *teacher support for staying-on* in this group has a zero order

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aware the currently available software will not provide this more appropriate set of parameter estimates. These relationships will be investigated more rigorously in the multivariate context in chapters 10 - 12.

[6] There is a substantial literature that indicates that such factors are important determinants of pupil attainment. An earlier analysis of Australian data indicated that the educational aspirations of families influence attainment at age sixteen (Cuttance, 1979).

correlation with all four measures of intake characteristics in the range .26 - .50 in magnitude. This construct is a direct parallel to that relating to parents' support for staying on, which was found to make the largest contribution to the multiple correlation between the non-school constructs and intake characteristics. The three *classroom pedagogy* constructs in the Instructional Factors group all have a similar structure of zero order correlations with the four compositional characteristics. The strongest set of zero order correlations within the *homework/extra teaching* construct subclass is that for *truanted - S2 to S4.* The only construct under the classification labelled *pastoral advice* that has zero order correlations greater than .30 in magnitude with the compositional characteristics is *school work encouraged* (by teachers), which reinforces the finding for *teacher support for staying-on* that was discussed above. The zero order correlations between compositional characteristics and the Social Outcomes constructs are generally less than .30, but that for *school worthwhile,* which has a correlation with mean intake composition of .50, is an exception.

One additional observation about the overall pattern of correlations between the process characteristics and the intake characteristics of schools is that schools with intakes that are skewed or which have a high kurtosis exhibit less favourable process environments. There is also support for the hypothesis that they have lower levels of mean attainment. This is readily seen from table 7.4 which summarises the relationships for the main process constructs. The skewness and kurtosis measures are correlated -.747, thus they are measuring substantially the same characteristics of these school intakes. Further, both the skewness and kurtosis measures have negative correlations with the school process constructs, and with the estimates of mean attainment. This suggests that the schools with intake distributions that are very unevenly spread (either very peaked, or highly skewed, or both) in terms of the range of the social background characteristics of pupils in the population are also those with the less favourable process environments, and they are also the lower attaining schools.

However, a caveat is in order because schools with intakes matching this description are also likely to be those with the most disadvantaged intakes, the 'ghetto' schools. Hence, there is the possibility that this relationship may, in reality, be masking other more important structural features of these schools.

Discussion

The finding that the multiple correlations of both school process constructs and non-school process constructs with intake characteristics are high indicates that intake characteristics cannot be interpreted uniquely as either indicators of unmeasured selection effects, or as proxy measures of school processes. Moreover, the fact that the multiple correlations between all process constructs and intake characteristics are not much larger than those for the school and non-school process constructs taken separately indicates substantial overlap in the variation in the intake characteristics of schools that is associated with school and non-school process constructs. Thus, even if unmeasured selection effects are proxied by intake characteristics, the schools almost fully adapt their processes to the intakes of pupils that they receive. Therefore, there is little to be gained from positing causal models that rely mainly on a partitioning of the variation associated with school intake characteristics, unless more proximal measures of pupil characteristics that relate to non-school selection processes and of school processes can be obtained. Even then there are fundamental conceptual problems that can only be resolved by theoretical models of the processes involved in teaching and learning. A simple causal formulation which specifies that the compositional characteristics of schools should be controlled for prior to assessing the causes of effectiveness may well remove variation in pupil outcomes that is the result of favourable school processes. In terms of estimating the effectiveness of schools this would disadvantage the more effective schools and mislead the researcher about the nature of the processes that in fact are

responsible for some schools being more effective than others. It is, however, important that every effort is made to control for any component of variation in school intakes that is correlated with unmeasured selection effects.

The analyses in this chapter have indicated that a subset of the school process factors are significantly correlated with estimates of the mean attainment of schools. They have also shown that there is a substantial degree of overlap in the covariation between variation in school process factors and the intakes of schools. The process that were found to be most strongly correlated with intake compositional characteristics were also those that had the strongest correlations with the estimates of school mean attainment. This held true for both the school and non-school related process constructs. However, an exploratory methodology was employed to reach these conclusions, and as such these findings are applicable to this sample only. Because of the nature of the school process measures available to this study there has been no attempt to test hypotheses in a confirmatory mode of analysis, therefore it would be unwise to infer that the correlations among the process constructs, compositional characteristics of school intakes, and estimates of the mean attainment of schools would hold in other situations, without substantiation from attempts to replicate the findings. The possibility that the pattern of correlations found are due to chance cannot be discounted without external evidence confirming these findings.

The analyses have not taken account of the variation between schools in their pupil intakes. The fact that process factors and school intake characteristics overlap to a considerable extent on their relationship to mean attainment suggests that the explanatory power of the former may be considerably weakened after control for variation in the latter. The rationale used to justify the strategy of not adjusting school outcomes for variation in school intakes in the analyses presented in this chapter was based on the argument that

some of the variation that is usually found to be associated with the mean pupil background characteristics of schools may be variation that is the result of influences that can also be attributed to process factors. By controlling for school compositional factors initially this covariation with outcomes that is jointly shared between process factors and compositional characteristics would have been removed from the estimates of school mean attainment. If school compositional factors do in fact act as proxies for unmeasured selection effects, then this strategy will be misleading, however, if, in the absence of measures of school process, they also act as proxies for the latter factors, then the strategy of not adjusting for school intakes is warranted. The debate in the literature has shown little potential of resolving the true nature of context effects, and the analyses of the present data have indicated that it is perhaps unlikely that attempts to disentangle the components of variation in school compositional characteristics that are uniquely due to selection and process related influences will be successful.

Chapter 8

The Extent of Variation in Attainment Among Schools

Introduction

This chapter analyses the extent and form of the variation in attainment between schools in Scotland. The three measures of pupil attainment described in chapter 6 are the focus of the present analyses, which describes the variation in these outcome measures between pupils and between schools. The following chapters will report analyses of variation in mean school attainment between educational sectors. The first analysis below describes the variation in attainment between pupils, and the relationship between social class and attainment. The second analysis reports on variation in attainment among schools on each of the three outcomes, and the third reports on covariation in mean attainment of schools across the three outcomes.

Social class variation in attainment

The pupil-level relationship between social class and attainment is well documented in sociological studies of schooling. The boxplots[1] in figure 8.1 indicate the distribution of attainment for pupils in each of the social classes for the present data. The regression line superimposed on this plot indicates that the relationship between social class and attainment at the pupil-level is of moderate strength (R^2= 0.19). In general, pupils from non-manual backgrounds achieve at a higher level than those from manual backgrounds. The boxplots, however, indicate that there is considerable variation in pupil attainment within each of the social classes.

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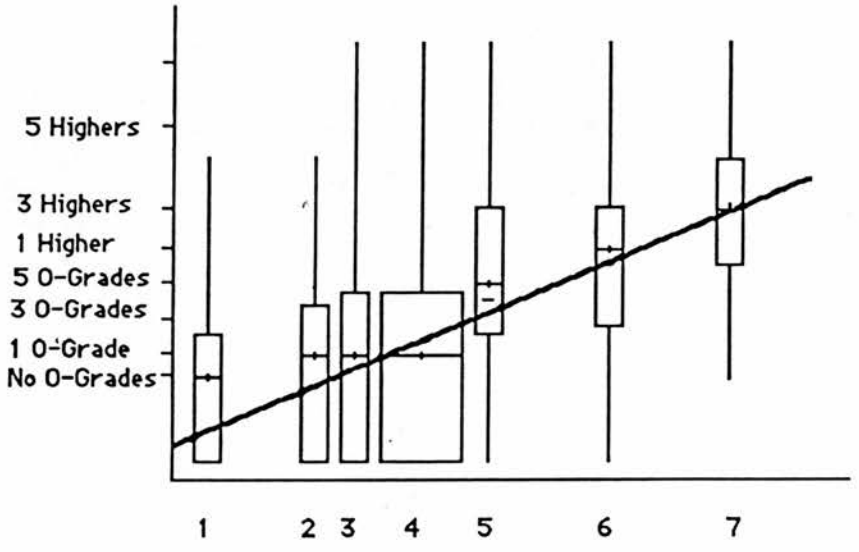
[1] Appendix B, based on Velleman and Hoaglin (1981), provides basic information on reading boxplots.

Figure 8.1 Pupil SCE attainment by social class



Legend 1 Unskilled 2 Semi-skilled 3 Unclassified
4 Skilled manual 5 Skilled non-manual
6 Intermediate 7 Professional

† Refer to appendix B for a discussion of the basis of the boxplots employed in this and later chapters.

The interquartile range of attainment varies between social classes. Although the interquartile range and the median are located toward the lower end of the attainment distribution for manual social classes, while they are located in the upper half of the distribution for the non-manual social classes, there are some pupils in all social classes that attain above the two Highers point that marks the seventy-fifth percentile point in the overall distribution of pupil attainments. However, a pupil attaining at the seventy-fifth percentile level *within* any of the manual social classes is attaining at a level which is below the median level for pupils from any of the non-manual social classes. The differential between the median attainment of manual and non-manual pupils is of the order of four SCE O-grade passes.

The proportion of variation in pupil-level outcomes that is accounted for by social class is between 11 and 18 percent, depending on the outcome considered. Thus, about one sixth of the inequality in attainment between pupils is attributable to pupil social class, with the remaining five sixths of the variation in attainment between pupils being independent of pupil social class. The analyses reported below investigate the extent to which schools account for some of the remaining variation in pupil attainment, after controlling for additional background characteristics of pupils.

Variation in mean attainment (quality) among schools

The statistical model outlined in chapter 5 is employed here to estimate the variation in quality and equity among schools. To recapitulate, the *within-school* model is specified as:

$$y_{ij} = \beta_{j0} + \beta_{j1}X_{ij1} + \ldots\ldots + \beta_{j4}X_{ij4} + \varepsilon_{ij} \qquad (8.1)$$

and the *between-school* model is

$$\beta_{j0} = \delta_0 + \mu_{j0} \qquad (8.2)$$

$$\beta_{j1} = \delta_1 + \mu_{j1} \qquad (8.3.1)$$

$$\beta_{j2} = \delta_2 + \mu_{j2} \qquad (8.3.2)$$

$$\beta_{j3} = \delta_3 + \mu_{j3} \qquad (8.3.3)$$

$$\beta_{j4} = \delta_4 + \mu_{j4} \qquad (8.3.4)$$

where; y_{ij} is the attainment of the i'th pupil in the j'th school; X_{ijk} is the k'th measure of pupil background characteristics; β_{j0} is the estimate of the mean level of attainment of pupils in the j'th school; β_{jk} (for k=1,..,4) is the regression of outcome on the k'th pupil background characteristic for the j'th school; δ_0 is the between-school mean outcome; δ_k is the mean of the within-school regression slopes for the k'th pupil characteristic across all schools; and ε_{ij}, μ_{j0}, μ_{jk} are random error terms representing the unexplained variation in the response variable.

The analyses of the pupil-level relationship between social class and attainment in the previous section parallels the between-pupil model in 8.1 above. The between-school part of the model is described by equations 8.2 and 8.3.1-8.3.4 and we now turn to analyses based on the full model as described by these equations. As noted earlier, school effectiveness can be thought of as consisting of two dimensions: a *quality* dimension indicating the level of performance of schools (the, β_{j0} in 8.2) and an *equity* dimension indicating the differential in performance between socially advantaged and socially disadvantaged pupils within schools (the β_{jk} in 8.3.1-8.3.4). Schools may vary from one another on both of these dimensions. Initially the analysis focuses on the dimension of quality, before considering the variation in equity differentials between schools.

As discussed when this model was introduced in chapter 5 the parameters representing school quality and equity can be modelled as either fixed or random effects. A fixed effects formulation is appropriate if the inferences to be made about the relationships modelled are to be restricted to the specific sample studied. In the case where all schools are represented in the data an argument can be made for this model, as the sample then exhausts the range of variation in the population of schools. However, the information about the quality and equity associated with each school is estimated with some uncertainty, unless the sample of pupils also completely describes the variation between pupils in the system. In this case the parameter estimates of quality and equity confound uncertainty from sampling variation with true variation in these features of schools. The random effects model can be employed to model this situation, and the systematic component of between school variation in the parameter estimates may then be interpreted as the average population value about which schools vary.

The fixed effects estimates of school quality are shown in figures 8.2a-c. The interquartile range of school quality for a pupil of average social class is in the region of three O-grade passes for the overall measure of SCE attainment, and about one to one and a half grades for the single-subject outcomes. The spread between the lowest and highest attaining schools at either end of the distribution of quality estimates is the difference between no O-grade passes and more than three Highers passes for the overall measure of SCE attainment, and from no presentations to better than a B grade pass for each of the single-subject outcomes. The question is whether differences of this magnitude are of substantive significance, and whether they represent the true range of variation in the system. The interquartile range of about three O-grade passes is somewhat less than the pupil-level difference between the median attainments of working class and middle class pupils in the

analysis presented above. For the overall measure of attainment the interquartile range in school quality is, however, approximately equal to the average improvement in pupil-level attainment in raw scores over the decade between 1975-1984 [2]. Thus, although the variation in quality between schools appears to be relatively small compared to the variation in attainment between pupils, it may not be small in comparison with variation over time.

Figures 8.3a-c show the variation in the random effects model estimates† of mean attainment for disadvantaged, average, and advantaged pupils for the two fourth year outcomes and for the overall SCE measure, after adjustment for the social background characteristics of the pupil intakes to schools. The boxplots represented in these figures, refer separately to the estimated school outcomes for the three types of pupil across all schools (the wider boxplots), and for the subset of all schools that were not subject to creaming by selective schools (the narrower boxplots), respectively [3]. Each boxplot represents the range of estimates for the adjusted outcomes for disadvantaged, average, and advantaged pupils in all schools. The points that underlie each boxplot are the random effects estimates for model 8.1 - 8.3.4. These estimates are analogous to those that would be obtained from reading off the expected outcome for pupils of a particular type on a graph like figure 5.7 for every school, although the statistical model employed here is somewhat more complex than this.

text recommences, after figures, on page 221

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[2] Based on the measure of overall SCE attainment employed in the present study and summary statistics of school-leaver qualifications for the period 1974-75 to 1983-84 (Cuttance,1986, table 3).

[3] This subgroup of schools is described in more detail in the next chapter.

† The *random effects estimates* are the estimates of the means of the conditional distributions given the data for each school. Appendix C provides a more technical statement of the model.

Figure 8.2a Distribution of estimates of mean attainment for fixed effects model: overall SCE measure

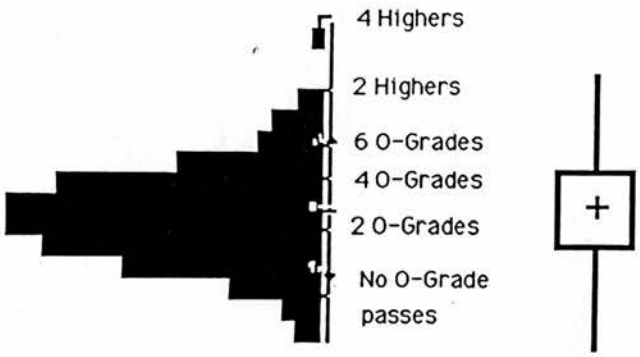


Figure 8.2b Distribution of estimates of mean attainment for fixed effects model: fourth year English

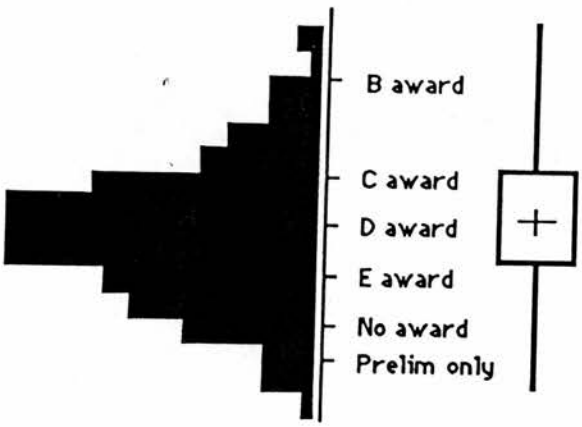


Figure 8.2c Distribution of estimates of mean attainment for fixed effects model: fourth year arithmetic

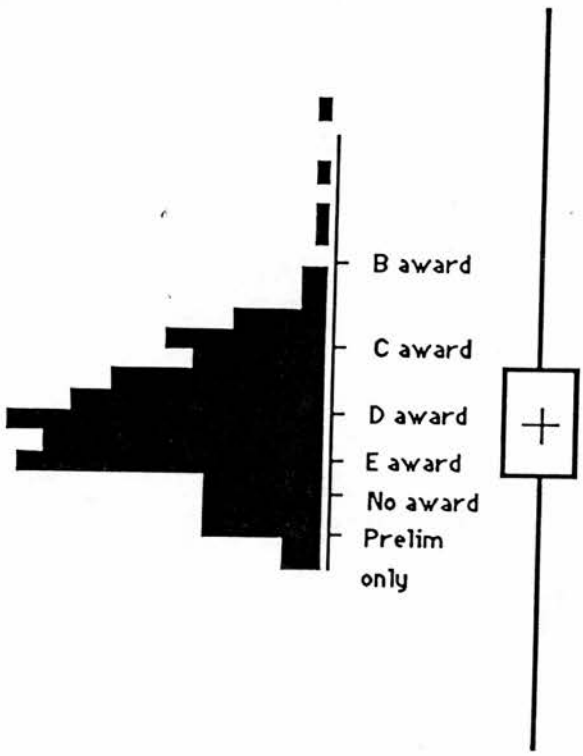


Figure 8.3a Adjusted estimates of mean attainment: overall SCE measure

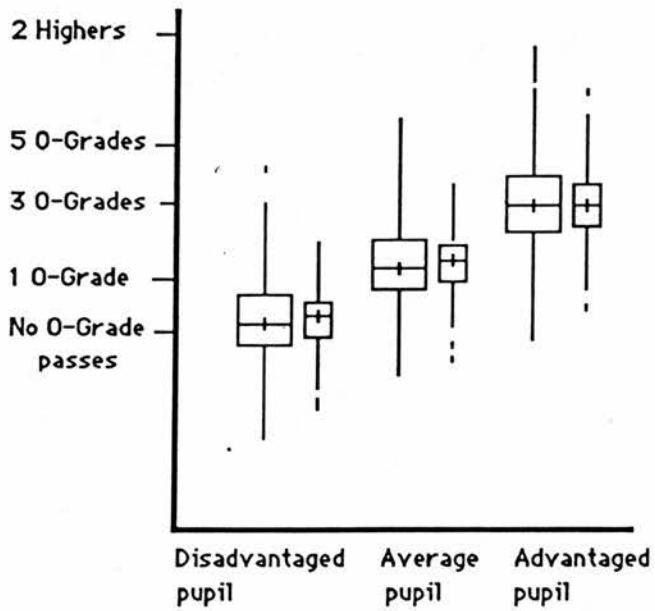


Figure 8.3b Adjusted estimates of mean attainment: fourth year English

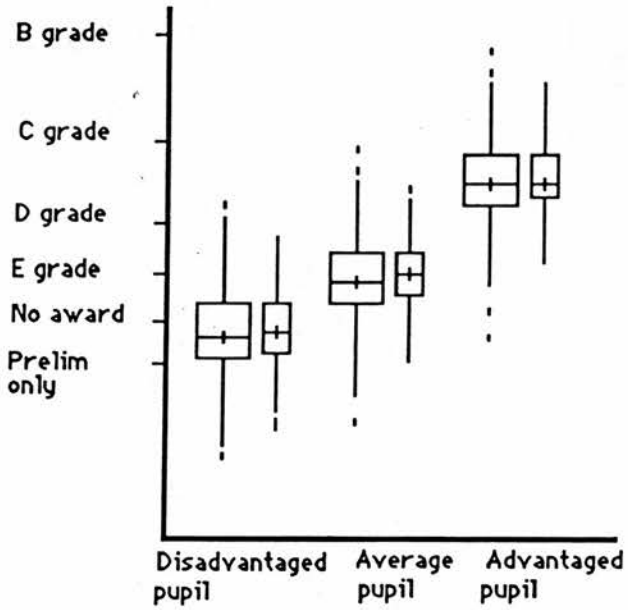
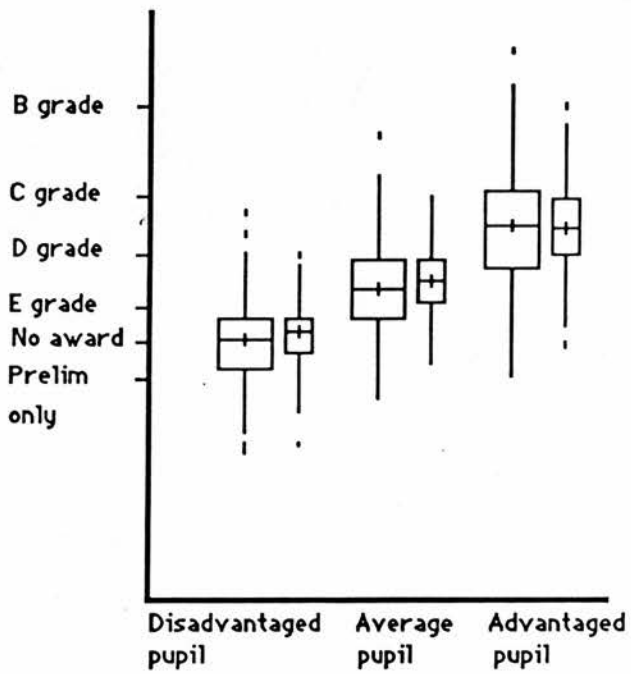


Figure 8.3c Adjusted estimates of mean attainment: fourth year arithmetic



The interquartile range of estimates of adjusted outcomes that are based on all schools in the system is fairly similar for all pupil types. Although, there is some evidence that the interquartile range for an advantaged pupil is larger than that for an average or disadvantaged pupil for fourth year arithmetic and for overall SCE attainment, but not for fourth year English. There is almost no overlap in the interquartile range of these adjusted estimates of school outcomes for the three pupil types. This means that the estimates of school attainment for pupils at the seventy-fifth percentile of the distribution for disadvantaged pupils are lower than the estimates for the twenty-fifth percentile of the distribution for an average pupil, and the seventy-fifth percentile of the distribution of attainment for average pupils is below the twenty-fifth percentile in the distribution for advantaged pupils. However, there are some schools for each pupil type which have outcomes for disadvantaged and average pupils that are much better than this. There are a small number of schools that have outcomes for disadvantaged pupils that are above the twenty-fifth percentile level for advantaged pupils, and some schools in which the average pupil attains at a level above the seventy-fifth percentile of the distribution for advantaged pupils. There are few schools with such exceptional outcomes on the two fourth year measures, but more on the overall SCE measure. The median level of adjusted school outcomes is very similar for the boxplots based on all schools and those based only on the 162 uncreamed schools. The main difference in the estimates between these two sets of schools is in the range of variation that they show. The analysis that is restricted to the 162 six-year uncreamed comprehensives exhibits less variation in range than that based on all schools in the system. The interquartile range is, however,

not substantially different for the two sets of schools.[4] For an average pupil the variation in the interquartile range of the adjusted school outcomes is of the order of one and a half O-grades on the overall SCE measure, and about one grade for each of the two fourth year outcomes. The interquartile range for adjusted school outcomes for disadvantaged pupils can be characterised as the difference between being presented for the examination and gaining an E grade mark for the two fourth year outcomes, and the difference between gaining no O-grade passes and one O-grade pass on the overall SCE measure. For advantaged pupils the differences are more or less equivalent to a grade difference in the two fourth year single subject outcomes, and are about two O-grades on the overall SCE measure, which is similar to the range of variation associated with the average pupil. These random effects model estimates indicate that the variation is less extreme than that indicated previously by the fixed effects estimates in figure 8.2a-c, and that the interquartile range of variation in quality between schools for an average pupil is probably about two O-grades, rather than the three suggested by the fixed effects model estimates.

Variation in equity among schools

Approximately ten percent of the fixed effects model estimates for social class slopes were negative, indicating that in those schools pupils from manual backgrounds are estimated to have higher levels of attainment in these data than pupils from non-manual backgrounds. In general, a number of such estimates will be associated with large standard errors of estimation, and will, therefore, not be reliable point estimates of the values for this parameter in each school. Alternatively, they may reflect deviant

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[4] The analyses in the next chapter address the issue of differences in mean attainment for different subgroups of schools in the system.

samples of data for the schools to which they pertain.[5]. There were no negative values among the random effects estimates for this parameter.[6] The equity differentials shown in figure 8.4 are composed of the net additive effects of equity differentials on all four of the covariates in the model [7]. The four numbered lines in the figure indicate schools at the 10th, 25th, 75th, and 90th percentile points in the distribution of equity differentials for the overall SCE measure. They show that there is relatively little variation in within-school equity differentials between the 25th and the 75th percentile of the distribution, but that the difference in equity differentials is probably of substantive interest for the fifty percent of schools that lie outside the interquartile range. The equity differential between a disadvantaged and an advantaged pupil in the most equalising school in figure 8.4 (the 10th percentile school) is of the order of one and a half O-grades, while in the least equalising school (the 90th percentile school) it is more than five O-grades.

In table 8.1 the first line of coefficients for each parameter refer to a model in which school quality is represented as a random effect and the equity differentials are represented by a single fixed effect across all schools. The second line of coefficients for each parameter represent a model in which the slopes are allowed to vary as random effects across schools, in addition to school quality being represented as a random effect.

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[5]It is not unusual to find that in small samples some data sets will exhibit such deviant slopes. In particular, such results are likely to be observed when the sample of pupils in the data for some schools represents only a restricted range on the background measures.

[6] The parameter estimates for the random effects models in this chapter and the next are based on Dr Nick Longford's VARCL program. The models in later chapters are estimated using Steve Raudenbush and Tony Bryk's HLM program. See also appendix C.

[7] The horizontal axis in figure 8.4 is scaled on the same metric as the social class variable, and the disadvantaged, average, and advantaged pupil boxplots are placed at the values of the social class variable associated with these three pupil types.

Figure 8.4 Multilevel model estimates of school quality and equity

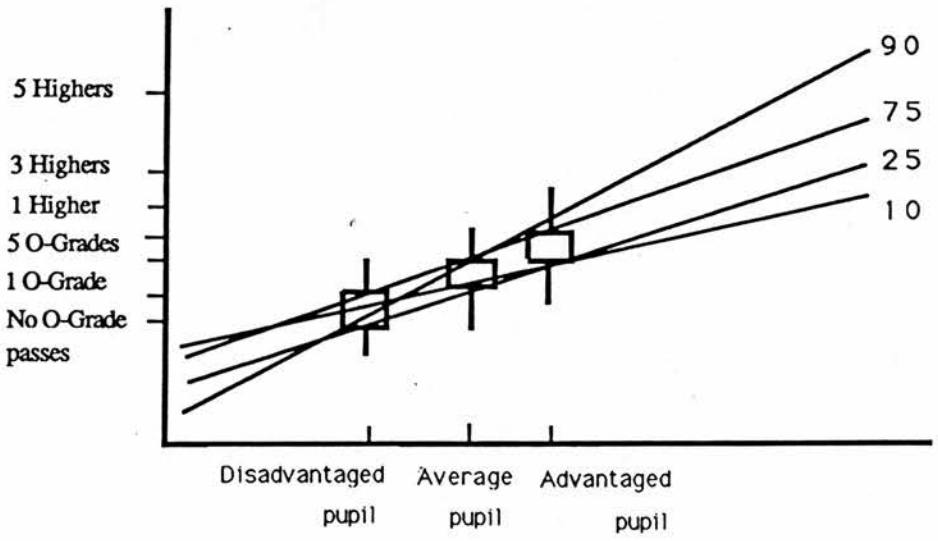

Table 8.1 Random effects model estimates of quality and equity differentials among schools

Covariate	Response Variable					
	English		Arithmetic		Total SCE	
Model	Effect	(Std error)	Effect	(Std error)	Effect	(Std error)
Estimates of quality						
Intercept						
Fixed slope model	.116	(.013)	.118	(.019)	.144	(.022)
Random slope model	.116	(.013)	.123	(.012)	.132	(.012)
Estimates of equity differentials						
Social class slope						
Fixed slope model	.024	(.001)	.025	(.001)	.029	(.001)
Random slope model	.024	(.001)	.025	(.001)	.029	(.001)
Mothers education slope						
Fixed slope model	.291	(.017)	.268	(.018)	.328	(.018)
Random slope model	.289	(.018)	.279	(.018)	.331	(.018)
Sibship size slope						
Fixed slope model	-.106	(.005)	-.101	(.004)	-.100	(.005)
Random slope model	-.105	(.005)	-.104	(.005)	-.103	(.005)
Gender slope						
Fixed slope model	.306	(.014)	-.063	(.013)	.049	(.015)
Random slope model	.308	(.016)	-.058	(.016)	.051	(.015)
Overall model statistics						
Model 1 Fixed slope model	47954.1		49298.2		49524.4	
Model 2 Random slope model	47885.8		49236.7		49494.3	
Difference in deviance: (Model1 - Model2)(df)	68.3	(8)	61.5	(8)	30.1	(8)
Percentage of total variance associated with school mean attainment: for different pupil types (random slope model)						
	%		%		%	
Disadvantaged pupil	8.8		6.9		11.3	
Average pupil	4.2		3.3		4.5	
Advantaged pupil	7.2		7.5		9.2	

The fit statistics for nested models can be employed to formally test whether parameters that are included in one model but not in the other make a statistically significant contribution to the fit of the former model.[8] The model statistics in table 8.1 indicate that the difference in fit between the model with random slopes and that with fixed slopes is statistically significant for all three outcomes, thus indicating that a model specification that includes random slopes is required to adequately describe these data. Tests of the heterogeneity of the regression parameters indicate that the intercept (estimate of quality) contains residual variation, as do the slopes (equity differentials) for social class and gender. The test of slope heterogeneity for the regression of attainment on mothers education and on sibship size were rejected at the .01 level. The variance components associated with school quality in the random slopes model depend on the values of the covariates at which they are assessed. The information in the bottom panel of the table indicates that the variance component associated with school quality ranges from three to eleven percent, depending on the outcome and the pupil type for which it is evaluated. The variance components for advantaged and disadvantaged pupils are generally about twice as large as those for the average pupil for all outcomes.

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[8] Personal communication from Dr Nick Longford. The fit statistic employed here is the deviance printed by the program for each model. The estimates of variance components from this program are subject to the qualifications of the model noted in appendix C, which also apply to the discussion of variance components at different values of the covariates (ie. for disadvantaged, average, and advantaged pupils) in the next section of text. The tests used here are dependent upon the origin values for continuous covariates employed in this analysis. All continuous covariates were centred about their sample means in this study.

Figure 8.5a The relationship of mean SCE attainment to mean attainment in fourth year English

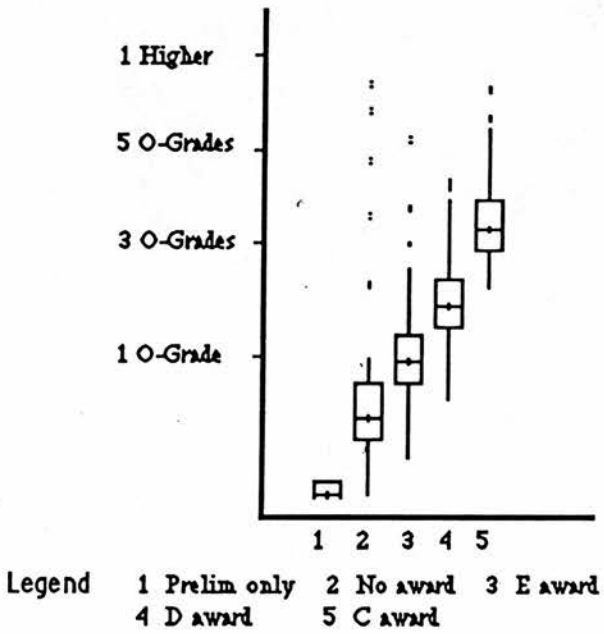
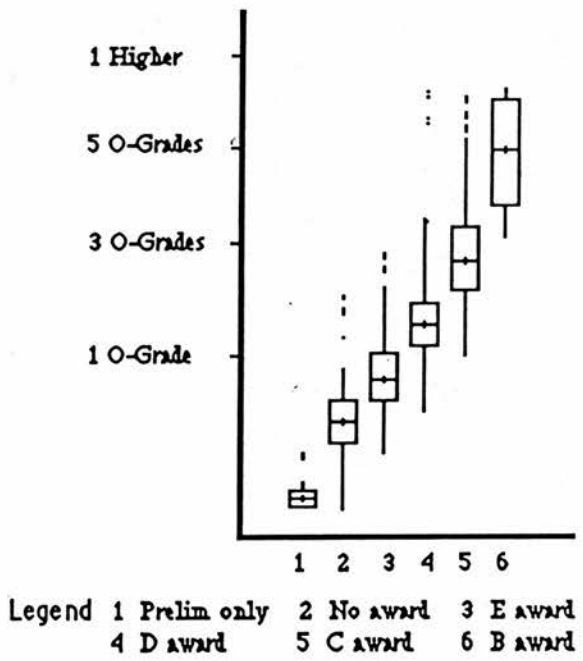


Figure 8.5b The relationship of mean SCE attainment to mean attainment in fourth year arithmetic



The dimensionallity of school attainment across outcomes

The multiple correlation between the estimates of quality on the overall measure and English is 0.47, while it is 0.74 for arithmetic, for an average pupil. This indicates the degree to which the estimate of quality on the overall SCE measure could be predicted from knowledge of the estimates of quality on each of the single-subject outcomes. These estimates are moderate to high but they still leave considerable room for variation in the quality of schools at each level of quality on the single-subject outcomes.

In order to probe this further the estimates of school quality on the single-subject outcomes were classified into discrete categories based on the metric originally employed to convert the pupil-level single-subject examination results into a continuous scale. This allows the school quality estimates to be described on the same categorical scale as pupil-level grades in the subjects. Hence, a school may be classified as having a quality level equivalent to, say, a D-grade in the respective subject. Figures 8.5a and 8.5b present the variation in school quality estimates for the overall SCE measure for each grade category in the single-subject estimates. The interquartile range on the overall SCE measure is at least one O-grade in each grade category of the quality estimates for the single-subject outcomes. There is ample evidence that some schools at each grade category on the single-subject outcomes vary considerably more than this on the overall SCE measure; the overall range of variation exceeding the equivalent of three O-grades in most instances.

Discussion

The finding that the estimate of equity varies across schools means that a simple regression model of outcomes on entry characteristics would misrepresent these data. The implication of this finding is that the effectiveness of schools varies for different types of pupil. For the purposes of the present inquiry three pseudo-pupils were defined on the basis of pupil background characteristics: a disadvantaged, an average, and an advantaged pupil. These definitions are based on the 25th, 50th, and 75th percentile points in the distribution of pupils on each of the background characteristics employed in the study. Thus, they refer to only one of an infinite set of pupil types which could be defined. The finding that it is necessary to allow for variation in slopes across schools also implies that there is variation in the differential in attainment between disadvantaged and advantaged pupils across schools.

The differences in attainment among schools were modelled by both a fixed effects regression model and by the full multilevel random effects model. The latter model takes account of the precision of the estimation of the equity differential and of the quality of effectiveness in deriving the estimates of variation between schools. In general, this leads to estimates of the range of mean attainment among schools that are somewhat lower than those derived from the fixed effects model. The difference between the two sets of estimates is, in part, an indication of the degree of imprecision associated with estimates of the equity differential and differences in school quality in the fixed effects model. This variation in the estimates from the two models is interpreted as an indication of the range of the probable true variation in the system under study. The general substantive conclusions are not affected by this range of variation, although it qualifies some of the more specific conclusions drawn from the analysis.

The interquartile range of variation in estimates of school quality is equivalent to a difference between one O-grade and three O-grade passes on the overall measure of SCE attainment, and one to one and a half grades in the two specific O-grade outcomes, English and arithmetic, for an average pupil. Although these estimates of the differences between schools are of substantive significance they represent only a small fraction of the variation in attainment between pupils. The multilevel model estimates of the variance component associated with school quality ranges from 11.3 percent for a disadvantaged pupil on the overall SCE measure, down to 3.3 percent for an average pupil in arithmetic O-grade. The general conclusion to draw from this finding is that, schools account for only a small proportion of the variation in attainment between pupils.

These findings are in line with those from a vast range of research over the last two decades or so. The universal pessimism that they engendered in the 70s among many members of the educational research community led to a refocussing of research away from large scale quantitative studies of systemic variation in the effectiveness of schools to studies of schools which were thought to exhibit substantial deviations in effectiveness from the average. There is, however, no conflict between the finding that a relatively small proportion of the variation in attainment between pupils is directly associated with schools and the premiss that there are substantial differences in effectiveness between schools. The despondency referred to earlier appears to have arisen from two sources. First, the belief that society could be substantially changed by reshaping the school system within the prevailing parameters of that system, and second that small variation between schools in terms of the variation existing between pupils meant that the differences between schools were inconsequential.

The findings from this analysis suggest that the differences in attainment among schools are of substantive import, even though they account for only a small proportion of the total

variation in attainment between pupils. For example, the one to two O-grade difference between schools at either end of the interquartile range for the overall SCE measure is probably slightly greater than the increase in the average level of attainment among school-leavers over the last decade. Although an advance of one to two O-grades appears small in comparison to the range of variation in individual pupil-level attainments, its significance can be gauged better when it is placed in a historical perspective. A linear interpolation of a gain of one O-grade in the attainment of the median pupil each decade would imply a median level of attainment of about four O-grades by the end of the century. Thus, a programme that raised the level of the least effective fifty percent of schools to the level of todays seventy-fifth percentile school would be worth more than the equivalent of a decade of progress.

The analysis of the dimensionallity of school quality also reveals substantial variation in within-school performance across curicula areas. Schools in each grade category of attainment in O-grade English and arithmetic are found to vary by more than one O-grade in mean attainment on the overall SCE measure, and the more extreme schools at each level of attainment in the single subjects show differences in mean attainment on the overall SCE measure of three or more O-grades. This variation in effectiveness on different outcome measures may reflect either within school variation at the department level, or of variation in school policies related to the distribution of teaching and learning resources among pupils.

The full range of variation between the lowest and highest attaining schools on the overall SCE measure, and on each of the single subject measures, is considerably greater than that indicated by the interquartile range employed as a benchmark in reporting most of the findings in this analysis. The motivation behind the use of a conservative indicator of variation in the system was to avoid the possibility that some of the more extreme instances of variation may be contaminated by chance

observations which do not adequately represent the particular school in question. Therefore, with some qualification, it is reasonable to suggest that the degree of variation in the system may be considerably greater than that indicated by the main findings reported above. For example, the extremes of the distribution of school quality on the overall SCE measure are from no O-grade passes for the lowest attaining school, to one Higher for the highest attaining school. Likewise, the extremes of mean attainment on the single subject outcomes are from schools with no presentations in those subjects, to schools which achieve a B-grade pass for the population average pupil. Although these schools which lie toward the extremes of the range in effectiveness on each outcome may be statistical outliers, this would be less likely to be due to aberrant observations if were found to lie in the extremes of the distribution for the estimated effectiveness scores on more than one outcome.

Perhaps the major development in the school effectiveness literature over the last decade has been the focus on studying schools which appear to have aberrant levels of effectiveness. As already noted the danger is that such schools may be classified as aberrant because they are mere statistical artifacts. The proportion of pupil-level variation in adjusted outcomes that lies between schools is relatively small, therefore large scale evaluations of the causes of school effectiveness need to employ measures and observational instruments that are particularly sensitive to the differences in the pedagogical and organisational aspects of schooling which give rise to this variation in effectiveness. One of the advantages of the random effects multilevel modelling approach is that it purges the variation between schools of error associated with the imprecision of the estimates of school quality. Variation in the organisational and pedagogical processes between schools can explain only this remaining systematic component of the variation in school quality estimates. Although only a small proportion of the total pupil-level variation, it is, nevertheless,

important to know which factors associated with schools do account for this variation in attainment among schools.

The findings from this analysis must be qualified because the model does not control for variation in the prior attainments of pupils at their point of entry to the secondary schools. Had this been available, the findings would almost certainly have suggested that the range of variation in mean attainment between the lowest and highest attaining schools was somewhat less than that reported, because various selection processes operate to ensure a non-random allocation of pupils of different prior attainments and abilities between schools. Not only do selection processes operate between school sectors (eg. between public and private schools, or between old established academies with good academic reputations and other schools within the public sector) but the structures determining the pattern of residential settlement in modern societies are the direct result of a wide range of social and economic selection processes.[9] Because Scottish public sector secondary schools during the period to which this study relates drew their pupils from catchments which were based on unique residential areas, their pupil intakes will have reflected the patterns of social and economic characteristics deriving from these more general selection processes. Differences in the valuations that families place on education, motivation, and other social and psychological characteristics of residential communities will be captured to varying degrees by the measures of pupil social background incorporated in the model employed in this analysis. To the extent that these characteristics of pupils are only partially controlled for by the covariates used in the present analysis, the range of variation in effectiveness between schools will be overestimated. The issue of the selectivity of schools is a

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[9] Some of these wider social processes and their formative impact on differences between schools are discussed elsewhere (Cuttance, 1979).

central focus of the next chapter, and selection effects also are a feature of the analyses in chapters 10 and 11.

Various specification issues have been discussed above, but others, including sector-level effects may also affect the estimates of school quality and equity on which the discussion above is based. Sector-level variation could conceivably account for much of the variation in both equity and quality between schools. The next three chapters investigate the issue of sector-level variation in the mean attainment of schools, and the extent to which the variation in mean attainment among schools is associated with the various measures of school process developed in the chapter 7

Chapter 9

Variation in Attainment Among Educational Sectors

Introduction

This chapter analyses variation in attainment among different types of secondary schools in the Scottish system. The classification of school types is derived from the variation in selectivity that existed among schools during the 1970s, from the types of community in which schools are located, and from the administrative divisions through which schools are governed.

These three typologies of sectors in the system were discussed in chapter 4. Their interdependence is evident from the historical overview of the development of the system that was presented in that chapter. In particular, there is an interdependence between the selective nature of the schools and geographical and administrative features of the system.

Substantive Models

The selectivity of the intakes to schools in the system is employed as a means of deriving a typology which divides the system into eight sectors: (1) all-through six-year comprehensive schools with uncreamed intakes, (2) all-through six-year comprehensive schools with creamed intakes, (3) all-through six-year comprehensive schools with uncreamed intakes, but which were formerly two-, three-, or four-year schools, (4) all-through six-year comprehensive schools with creamed intakes, but which were formerly two-, three-, or four-year schools (5) selective EA and independent schools, (6) short-course feeder schools, (7) all-through six-year comprehensive schools which also had a selective intake on transfer from the above short-course feeder schools at the end of the second or fourth year of secondary schooling, (8) other schools, a small group of schools not

classifiable on any of the above criteria. [1] The comprehensive schools that were established comprehensives prior to the entry of the present cohort of pupils (sectors 1 and 2 in the above typology) will be referred to as the established comprehensives, and the more recently established comprehensives (sectors 3 and 4) will be referred to as the transitional comprehensives.

The geographical sectors developed in the earlier historical overview are: (1) cities, (2) large burghs and towns, (3) small burghs and towns, (4) rural areas, and (5) New Towns. McPherson (1983) and McPherson and Willms (1986) have argued that the geographical division of schools within the education system relates to wider social, economic, and cultural features of Scottish society and history. There are also numerous reports of differences in the education system in the early literature that relate to geographical division of the system along these lines. For example, the interaction between school attendance and agricultural seasons was often noted in the reports of inspectors in the earlier decades of this century (Wade, 1939), and McPherson (1983) documents a disproportionate representation of teachers from the burgh and town schools on educational decision making bodies in the two decades following the Second World War. The historical overview in chapter 4 indicated that the development of the omnibus school in the inter-war years was principally a phenomenon of the single-school burgh and town communities, and that the feeder-receiver school system was operated as a joint enterprise between burgh and town schools, and those in rural areas. Further, the junior/senior secondary system was largely a phenomenon of the cities and of the multiple-school towns and burghs.

The administrative division of schools follows the local government boundaries which emerged from the reforms of 1975. The local government region of Strathclyde encompasses almost

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[1] The last 'residual' category contains only nine schools, and is not considered in the analyses presented below.

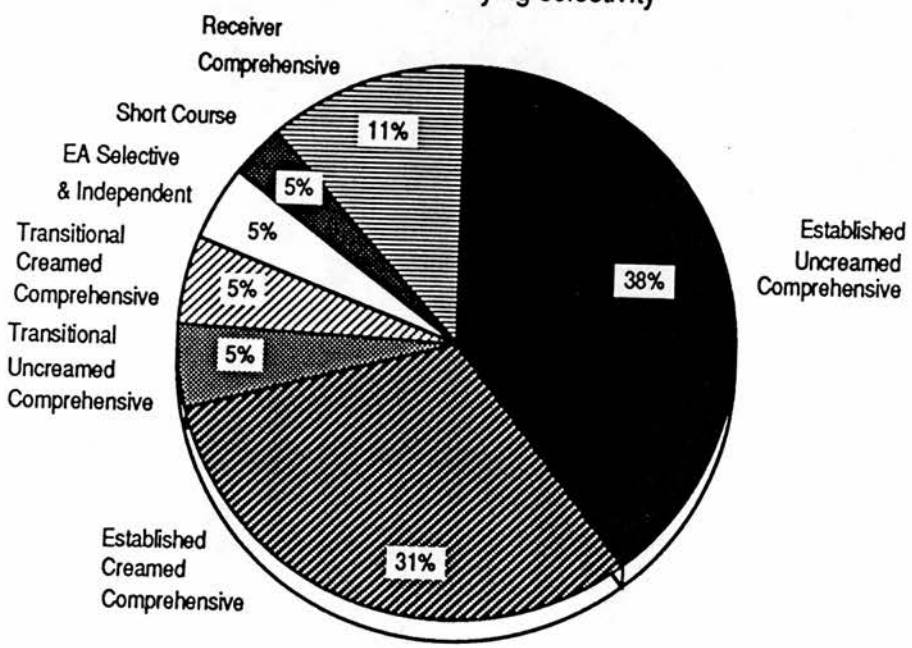
half the school population of Scotland, and is represented by its constituent administrative divisions, which themselves have populations comparable to that of many of the regional authorities.

The interaction across categories of these three sectorial typologies of the system indicates that the three typologies do not describe the system independently of each other. Hence, any explanation of the variation in effectiveness among schools that is accounted for by the classifications within one or other of the typologies requires careful interpretation as it may also be reflecting characteristics of the system that could also be attributable to one of the other typologies, or indeed to a range of further typological classifications of the system not considered here. The three typologies considered here do not constitute a single hierarchical model of the system, and therefore they cannot be simultaneously modelled within the multilevel framework described in chapter 5. Because of this they will first be analysed separately from one another, and a subsequent analysis will be undertaken to assess the degree of interaction between them.

Analyses

The analyses of variation in among sectors presented below includes information on sector size, the distribution of pupils by social background, and the variation in attainment within each of the sectorial typologies outlined earlier of the school system. After presenting this information an analysis of the interaction between the effects associated with each of the three sectorial typologies of the system will be presented.

Figure 9.1 Distribution of pupils among sectors of varying selectivity



Effectiveness and the selectivity of schooling

Figure 9.1 shows that the established comprehensive schools account for almost seventy percent of the pupils in the leaver cohort studied here, although they comprise a smaller proportion of the schools in the system, fifty-six percent. Among established comprehensives there are 139 uncreamed schools and 108 creamed schools. The proportion of all pupils in transitional comprehensives is ten percent, and there are 48 such schools in the system, half of which are creamed. The selective sector accounts for only a quarter of all pupils, and three-fifths of these are in in the short course/receiver subsystem that caters particularly for pupils in rural areas. This leaves only five percent of all pupils who are in what we would normally be referred to as selective schools, the Local Authority selective schools and the Independent schools. The short course schools and this latter selective group of schools are generally much smaller in size than their counterparts in the comprehensive sector, and although they account for only ten percent of all pupils they comprise a quarter of all schools in the system. Figure 9.2a confirms the variation in the social selectivity of schools in these sectors. The most striking feature of the analysis presented in that figure is the very low representation of pupils from families of manual social class background in the EA & Independent sector. Whereas the proportion of such pupils in the other sectors is of the order of 60-70 percent, it is less than twenty-five percent in this sector. Among the comprehensive school sectors there is an increasing representation of pupils from manual backgrounds as one reads the figure from left to right. Thus, the established comprehensive sector is more socially advantaged in terms of pupil social class, with the effects of creaming being evident although not particularly large overall. The largest effects of creaming are in respect of the intermediate social class group (white collar workers, and lower status professionals). The social class composition of the short course sector is similar to that for the creamed transitional

comprehensive sector, while the composition of the receiver sector is more socially advantaged than any of the comprehensive sectors. This latter feature reflects the socially selective nature of the process which determines the group of pupils who transfer from the short course to the receiver schools for their post-compulsory education. [2]

Figure 9.2b indicates that these variations in the social selectivity of the sectors is also reflected in variation in their SCE examination attainment. Three-quarters of the pupils in the EA and Independent sector attain at least one Higher grade pass, while the proportion attaining at this level in other sectors is of the order of one fifth. The proportion of pupils gaining less than one O-Grade pass is about one-third in each of the comprehensive sectors, about half in the short course sector, and about one-quarter in the receiver sector. The differences in the proportions between attainment bands at higher levels among the various comprehensive sectors is generally less than five percentage points. In particular, there is little variation among the various comprehensive sectors in terms of the proportion of pupils attaining three or more Highers, the notional criteria for entry to higher education.

The selectivity of the system and the aggregate variation in the attainment profiles for the various sectors indicates the possibility of variation in mean attainment among sectors. The mean attainment of schools[3] after controlling for pupil-level social background characteristics is reported in figures 9.3a-c.

text recommences, after figures, on page 248

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[2] Some pupils also transfer at an earlier stage, before embarking on their SCE examination syllabus courses.

[3] The boxplots represent schools, not pupils, ie. they are based on the estimates of mean attainment for schools. In most cases the *mean* attainment for schools will be abbreviated to the *attainment* of schools.

Figure 9.2a Distribution of social class within sectors of varying selectivity

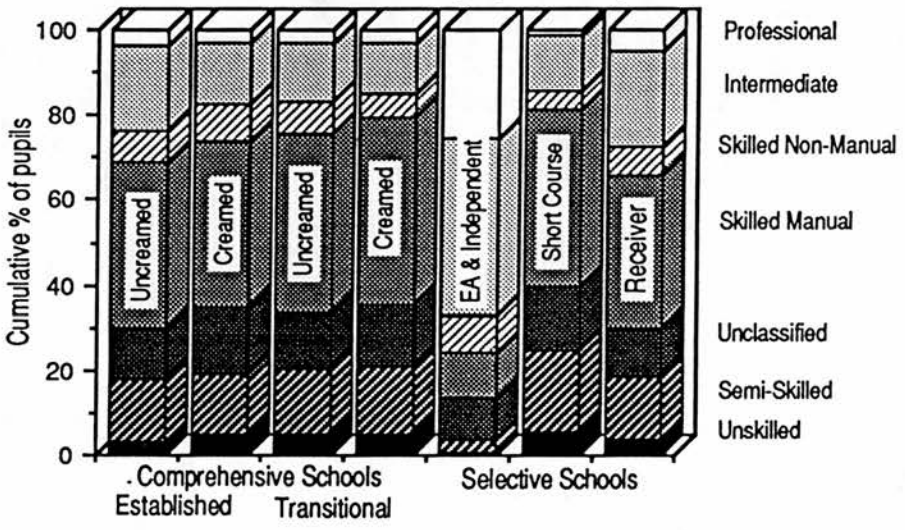


Figure 9.2b Distribution of attainment within sectors of varying selectivity

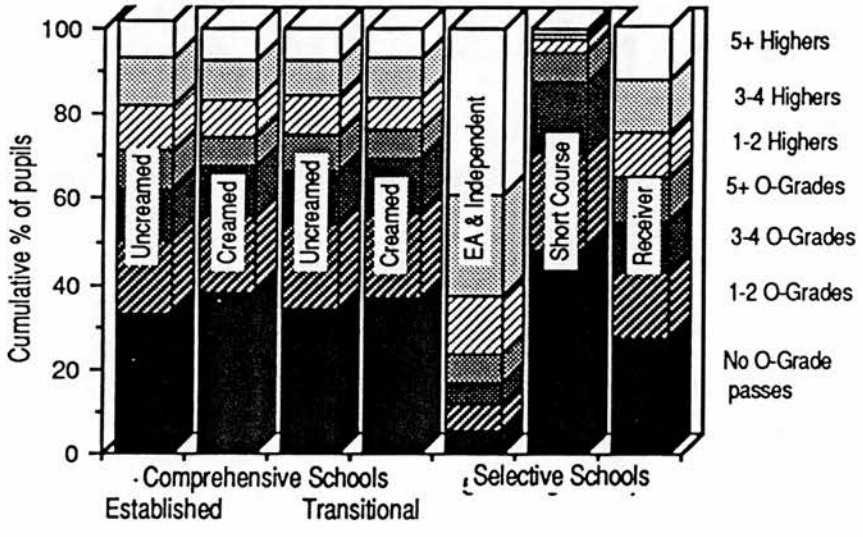
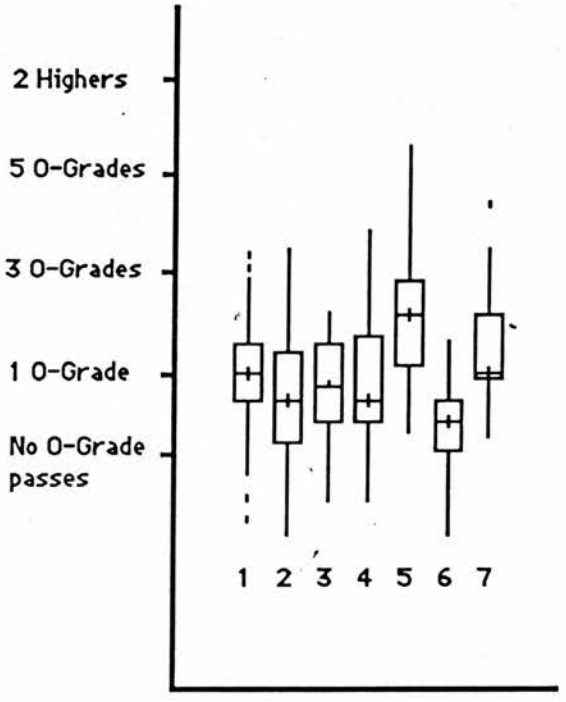


Figure 9.3a Adjusted estimates of attainment among sectors: overall SCE measure



Legend

	Type of school	Selectivity	No of schools
1	Established Comprehensives	Uncreamed	139
2	Established Comprehensives	Creamed	108
3	Transitional Comprehensives	Uncreamed	24
4	Transitional Comprehensives	Creamed	24
5	EA & Independent	Selective	54
6	Short course feeder	See text	59
7	Receiver	See text	37

Figure 9.3b Adjusted estimates of attainment among sectors: fourth year English

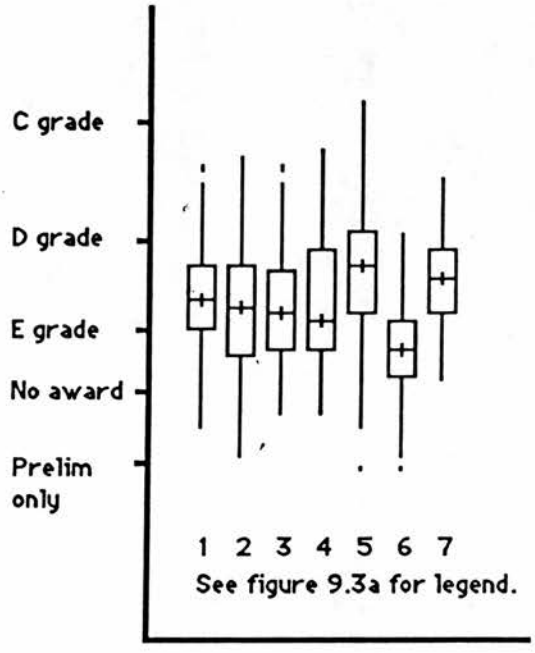


Figure 9.3c Adjusted estimates of attainment among sectors: fourth year arithmetic

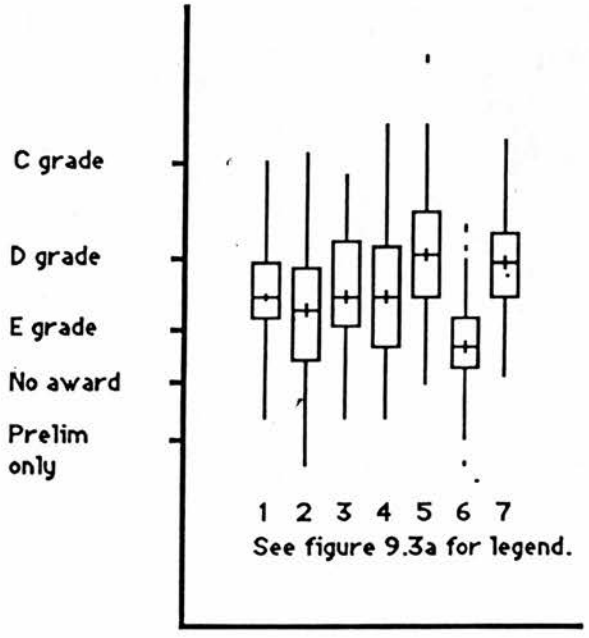


Table 9.1 Tests of sector effects: intercepts and slopes

Sector Typology	Model Parameter	English Fit	English Prob	Arithmetic Fit	Arithmetic Prob	Total SCE Fit	Total SCE Prob
Selectivity of schools	Intercept	50	<.05	101	<.05	165	<.05
	Slopes:						
	Social class	19	<.05	8	<.05	12	<.05
	Mothers education	13	<.05	4	>.05	4	>.05
	Sibship size	5	>.05	0	>.05	0	>.05
	Gender	4	>.05	0	>.05	1	>.05
Type of community	Intercept	6	<.05	3	>.05	1	>.05
	Slopes:						
	Social class	1	>.05	0	>.05	0	>.05
	Mothers education	8	<.05	0	>.05	2	>.05
	Sibship size	6	<.05	0	>.05	7	<.05
	Gender	6	<.05	1	>.05	3	>.05
Educational authorities	Intercept	5	<.05	7	<.05	9	<.05
	Slopes:						
	Social class	3	>.05	6	<.05	4	>.05
	Mothers education	0	>.05	1	>.05	1	>.05
	Sibship size	0	>.05	1	>.05	0	>.05
	Gender	17	<.05	2	>.05	1	>.05
Cross-classification of typologies: selectivity by type of community	Intercept	20	<.05	47	<.05	14	<.05
	Slopes:						
	Social class	23	<.05	14	<.05	13	<.05
	Mothers education	18	<.05	8	<.05	3	>.05
	Sibship size	4	>.05	4	>.05	0	>.05
	Gender	5	>.05	0	>.05	1	>.05

The fit statistic employed is a likelihood ratio test statistic. The values indicated in the table are the difference in the fit of the model for the addition of the parameter indicated. The fit of the sector level intercept is assessed against the fit of the same model with this parameter omitted. The slope parameters are then assessed against the fit of this last model. The fit statistics have a chi-square distribution with one degree of freedom for the intercept parameters, and with two degrees of freedom for the slope parameters. Statistics that are <.05 are statistically significant.

These estimates are based on the two-level (pupil-school) model presented in equations the previous chapter (equations 8.1 to 8.3.4). The model controls for pupil-level social class, mother's education, number of siblings, and pupil gender. [4] These figures indicate the range of adjusted mean attainment for schools within each sector for an average pupil in the national population. In essence then, this analysis addresses the question of whether there is variation in the effectiveness of schools among sectors after the above characteristics of their pupils have been taken into account. If the higher attainment profile of the selective EA and Independent school sector is due merely to the socially more advantaged pupils that it recruits, then the effectiveness of this sector will be shown to be no greater than that of other sectors. However, it would also be possible for the relatively similar aggregate pupil social class and attainment profiles of the four comprehensive sectors to mask variations in the distribution of effectiveness among these sectors.

Figures 9.3a-c reveal variation in the distribution of the mean attainment of schools within the four comprehensive sectors, and variation in the median level of attainment for schools among sectors. The EA and Independent schools sector has the highest median level of mean attainment and the sector based on the short course schools has a lower median level of attainment than other sectors, across all outcomes. These figures represent the mean attainment of individual schools for a pupil of average background characteristics. Table 9.1 presents information from a model of the performance of pupils after taking into account the hierarchical structure of the data. The

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[4] The box plots of the estimates from the two-level model does not impose the sectorial typology employed here on the analysis until after the estimation of the model. The three-level model, on the other hand, imposes the sector-level specification before estimation of the model. Since neither model is likely to represent a full specification of the relationships between levels, the two-level estimates are employed as a means of exploring the variation among sectors, and among schools, and the three-sector model is employed to formally test the hypothesis that variation is associated with this particular typology of schools in the system.

model on which they are based is a three-level model: pupil-school-sector. This is a direct extension to the two-level model in 8.1 - 8.3.4. The extension to a third level involves the use of an indicator of sector membership to model the school-level variation in intercepts and slopes, ie the estimates of school quality and the equity differentials. For the present purposes the sector effects are treated as random effects. The statistics in the table indicate whether there are statistically significant differences between sectors in terms of their intercepts and slopes on the four pupil background covariates. They show that there is variation in mean attainment (the intercept) among sectors of varying selectivity. However, the only slope parameter that is statistically significant across all three outcomes for this typology of the schools in the system is that for social class. Thus, there appears to be variation between sectors of differing selectivity in terms of their mean pupil attainment and in terms of the regression slope of social class on the three outcomes, but no consistent variation among sectors in terms of the slope of the other three background covariates, although the slope for mothers education is statistically significant for two of the three outcomes.

Comparison of the uncreamed and creamed schools among the established comprehensive and transitional comprehensive sectors shows that the former sector has the higher mean levels of attainment on the overall SCE measure, and on fourth year English, but that the transitional comprehensives have higher levels of attainment for fourth year arithmetic. The mean attainment of the two sets of schools that comprise the feeder-receiver subsystem differs markedly, with the receiver schools having a much higher median level of attainment, even on the fourth year outcomes. The selective nature of the transfer of pupils from the feeder schools to the receiver schools in this subsystem is the likely explanation for the differentials between the two parts of this system. Because of the way in which creaming of school intakes was defined, most of the creamed schools are in the cities or the larger burghs and towns, while the

uncreamed schools are mainly in smaller communities. Hence, the generally lower median levels of attainment for the creamed comprehensives in comparison with their uncreamed counterparts may also be due to the type of community in which they are located.

The variation between sectors is, however, relatively small compared to the variation within sectors. Within-sector variation in attainment tends to be greater in the EA and Independent sector. The uncreamed schools in both of the comprehensive sectors are less variable than their creamed counterparts. The established comprehensive sectors have a greater range of within-sector variation in attainment than the transitional comprehensive sectors, although the inter-quartile ranges between like sectors in the two groups do not vary by more than about half an O-Grade. Schools within each sector of the feeder-receiver subsystem appear to be generally less variable than those in other sectors, although the variation within each of the uncreamed comprehensive sectors is of a similar magnitude. Generally, sectors with the lowest levels of selection exhibit less within-sector variation in mean attainment among schools than those whose intakes are more selective, with the exception of the feeder receiver sectors. In particular, the selective EA and Independent sector appears to contain schools of a wide range of effectiveness. There are some schools in every sector that are among the more effective schools in the system. For example, each of the comprehensive sectors contains a few schools that are performing at a level above that of the seventy-fifth percentile school in the EA and Independent sector. Thus, the median effectiveness of the various sectors should not be allowed to obscure the fact that there are schools in every sector that exhibit a high level of effectiveness in terms of the performance of all other schools in the system.

One of the purposes of analysing the variation in mean attainment among schools in terms of the present sectorial typology is to assess the extent to which that variation is related

to the selectivity of school intakes. In particular, it is important to attempt to ascertain whether the estimates of between-school variation are partially an artifact of the unavailability of of a prior attainment measure in the model.

The analysis thus far indicates variation in the median levels of attainment among sectors, and that this variation is relatively small among the four comprehensive school sectors, but somewhat larger among the three selective sectors. In the analyses in the rest of this chapter, the variation in attainment among communities, and among educational authorities is investigated. The interaction between the selectivity of school intakes and the mean attainment of schools in sectors based on these two typologies of the system will also be investigated. The historical analysis in chapter 4 indicated that the selectivity of schools may vary in different types of community. Further, recent analyses of variation in attainment among local authorities in England have not been able to control fully for the degree of selectivity of school intakes within authorities (Gray, 1987; Marks *et al*, 1985). Chapters 10 and 11 will then formally model the effects of the selectivity of school intakes, and investigate these in the context of statistical controls for the composition of school intakes, and for the influence of school process factors on attainment.

Variation in mean attainment among communities

A typology of communities in relation to schooling was set out earlier. It defined five types of community: (1) cities, (2) large burghs, (3) small burghs, (4) New Towns, and (5) rural areas. Figure 9.4 shows the division of pupils among these geographical sectors of the system. The city and small burgh sectors are of approximately equal size with each accounting for almost one third of the total secondary school population. A further quarter of the pupil population attend the schools located in the large burghs, while rural areas account for about one tenth, and the New Towns about one twentieth of the pupil population. The schools in

the rural areas are, however, much smaller than their urban counterparts. Although rural areas contain only one tenth of the pupil population they account for seventeen percent of the schools in the system. This is largely offset by the above average size of schools in the large burghs [5] which are the site of most of the receiver schools that form the complement to the rural feeder school system.

Figure 9.5a shows the distribution of pupils by social class within communities. The most striking aspect of this analysis is the similarity in the social class composition of these community sectors. Between 67 and 77 percent of pupils in all communities are from families in which the male income earner is employed in a manual occupation. Figure 9.5b describes the within sector distribution of pupil attainment in SCE examinations. The sector with the largest proportion of pupils leaving school with less than three O-Grade passes is the city sector (53%), and the sector with the smallest proportion is the small burgh sector (46%). The city, and the two burgh sectors each had about twenty-one percent of their pupils attaining three or more highers, the notional entry requirement for higher education. However, the rural and New Town sectors are lower with 18 and 13 percent, respectively, attaining at this level. Although there is some differentiation in pupil attainments between these communities, there is no community which clearly has a higher attainment profile overall, although small burghs appear to have a slight advantage at most levels. In general, however, small differences in attainment between sectors in a particular direction at one level appear to be offset by differences in the other direction at other levels.

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5 The large burghs contain 23% of the pupils but only 19% of the schools in the system.

Figure 9.4 Distribution of pupils by type of community

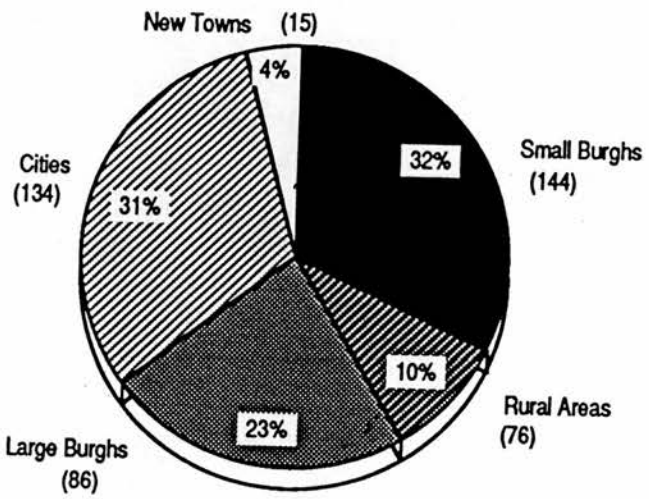


Figure 9.5a Distribution of social class within different types of community

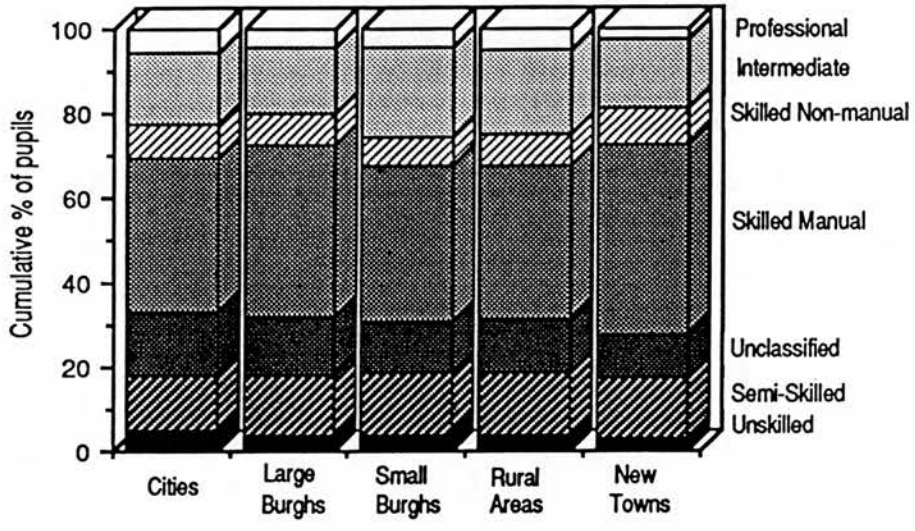


Fig 9.5b

Figure 9.5b Distribution of attainment within different types of community

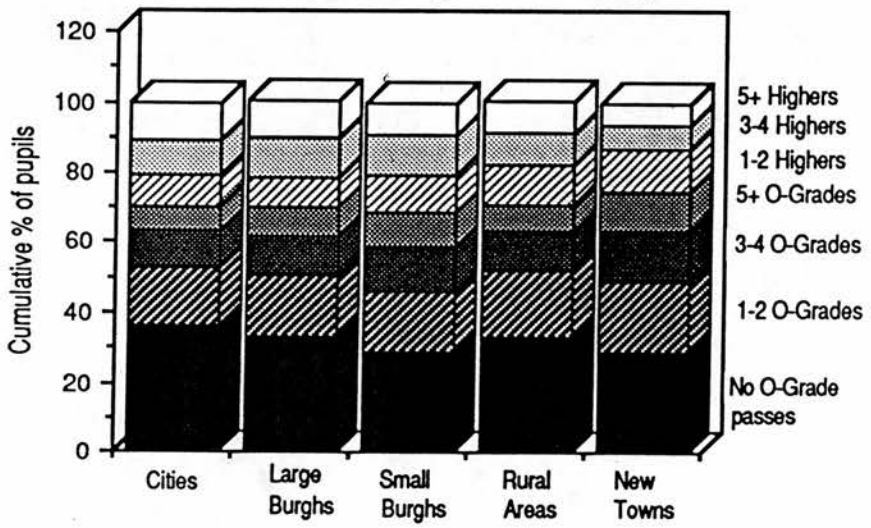
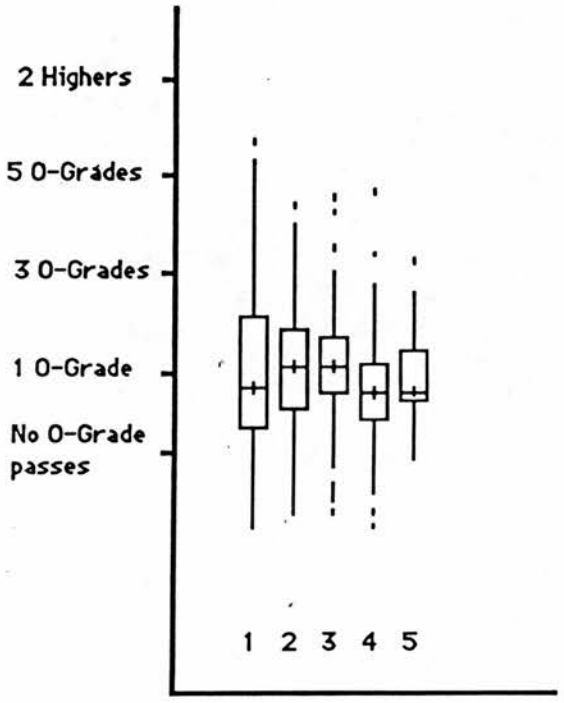


Figure 9.6a Adjusted estimates of attainment among communities: overall SCE measure



Legend	Type of community	No of schools
1	City schools	134
2	Large burgh schools	85
3	Small burgh schools	143
4	Rural schools	77
5	New Town schools	15

Figure 9.6b Adjusted estimates of attainment among communities: fourth year English

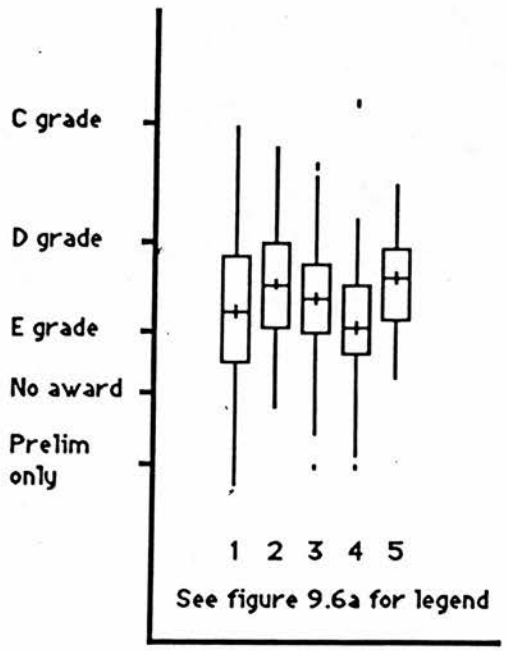
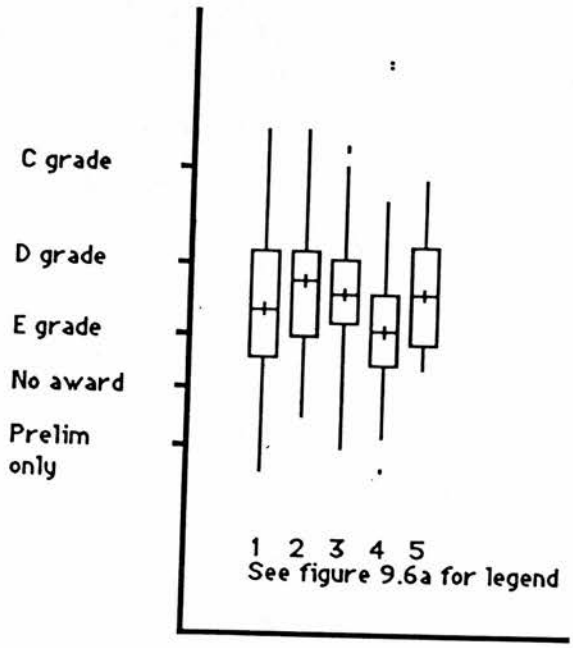


Figure 9.6c Adjusted estimates of attainment among communities: fourth year arithmetic



Given the relative similarity of the aggregate social class composition of these sectors based on the type of community in which schools are located, and the similarity of the aggregate unadjusted distribution of pupil attainment in each, there might seem little reason to suspect any substantial variation in the effectiveness of schools across these communities. Figures 9.6a-c show boxplots of the adjusted estimates of the mean attainment of schools for a pupil of average background characteristics for these communities. These plots indicate that the median level of attainment varies by less than an O-Grade between sectors on the overall SCE measure, and by less than a grade for each of the fourth year outcomes. The median level of attainment is lowest in the rural sector, and is generally highest in the large burgh sector, across all outcomes. Small burgh schools perform almost as well as those in large burghs, while the median level of attainment among city schools is below that of those in the burghs. The rank ordering of the median level of the effectiveness of schools in all sectors is constant across outcomes, with the exception of that for New Town schools. New Town schools have a low median level of attainment on the overall SCE measure, but a relatively high median level on the two single subject outcomes. They appear to be more effective than city schools in O-Grade arithmetic, and have a higher median than all other sectors in English O-Grade.

The range of variation within sectors is greatest for the city schools. The within-sector variation generally increases with increasing urbanisation of the sector. This pattern is particularly clear for the within-sector distributions among the non-rural sectors on the overall SCE outcome measure. On all three outcomes the New Town sector has a much narrower range of attainment among its schools than the large burghs and cities. Given the earlier finding that the social class distribution of all these sectors is very similar, this finding of differential within-sector variation in attainment is thus not explainable by the global characteristics of social class composition among sectors.

It may, however, be associated with the pattern of social class segregation within communities.

The information in table 9.1 suggests that there is statistically significant variation in the slopes and the mean level of pupil attainment among communities for the fourth English outcome only. The variation in mean attainment among communities for the other two outcomes is not statistically significant, nor is the variation among sectors associated with slopes on any of the four covariates on these outcomes .

Variation in mean attainment among educational authorities

As outlined earlier, Scottish secondary education in the public sector is administered through a system of local government authorities. The Independent schools have been omitted from the analyses presented in the present section as they do not fall within the administrative jurisdiction of these authorities. The public school system catered for 96 percent of the secondary school population in 1981 when the present cohort left school. There are nine regional authorities and four Island authorities, but for the purposes of the present analyses the six administrative divisions within the largest regional authority, Strathclyde, are treated as separate sectors. Thus, the system can be viewed as consisting of seventeen separate administrative sectors. These educational authorities are of varying size, with the larger containing between sixty and seventy secondary schools, and the smaller less than ten. Figure 9.7 presents statistics on the percentage of the total pupil population and the number of secondary schools within each authority in 1981. Comparing the number of schools with the proportion of the school population within each authority indicates that the average size of schools varies considerably across authorities.

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Figure 9.7 Distributibution of pupils and schools among educational authorities

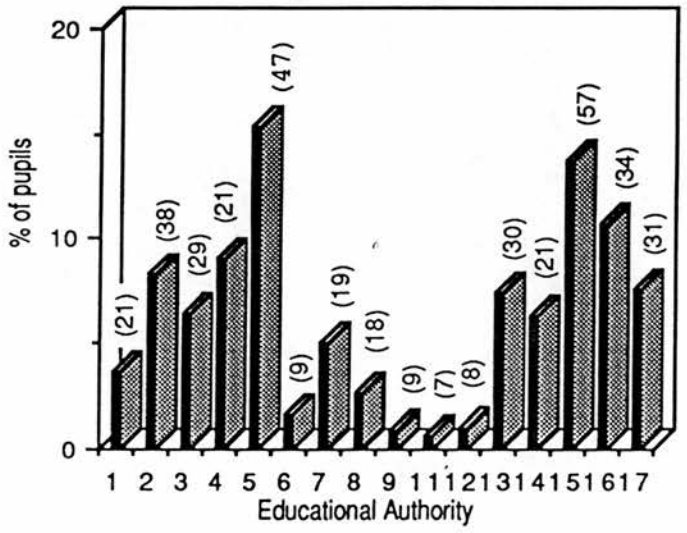


Figure 9.8a Distribution of pupil social class: by Educational Authority

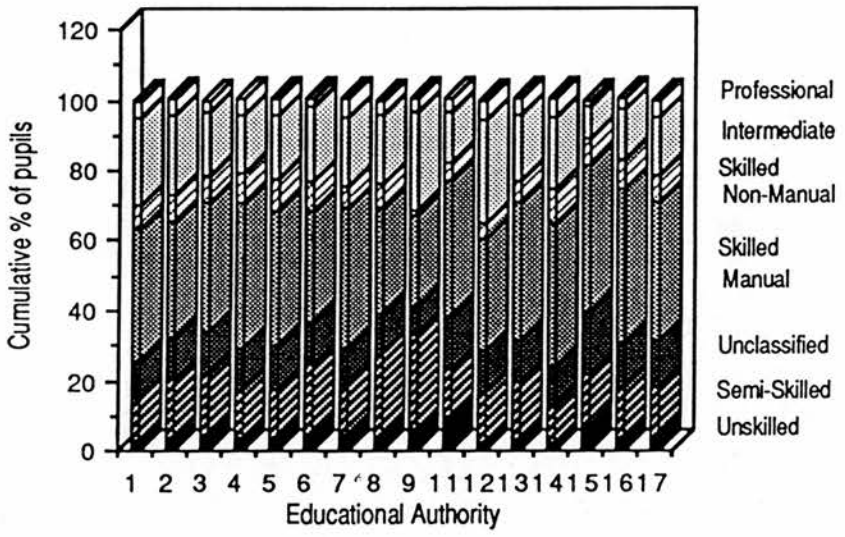


Figure 9.8b Distribution of pupil attainment: by Educational Authority

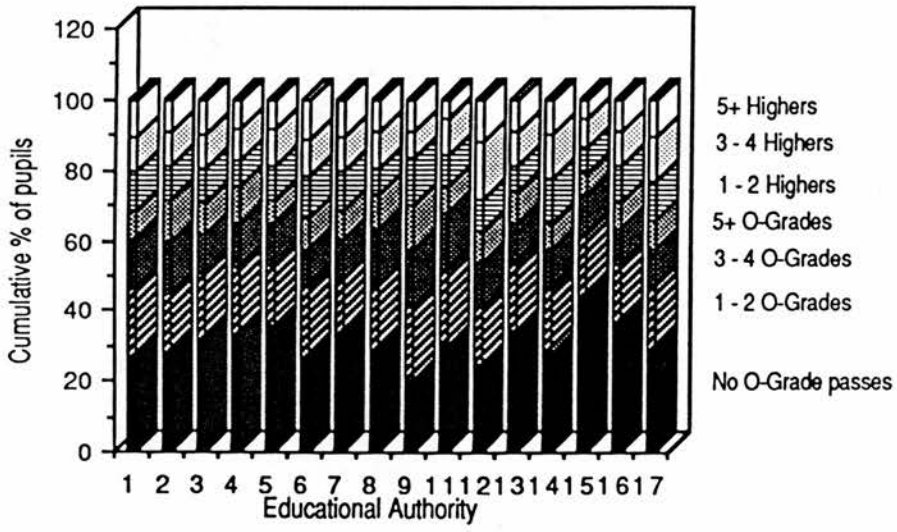


Figure 9.8c Social class composition and pupil attainment: by educational authority

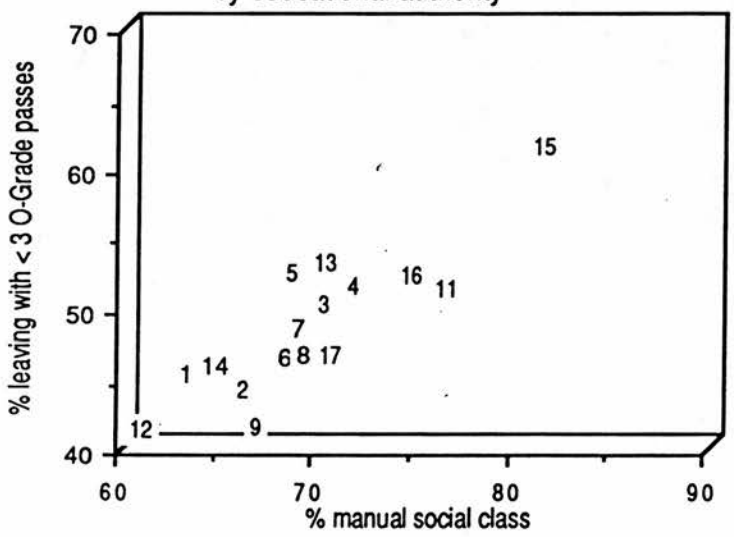
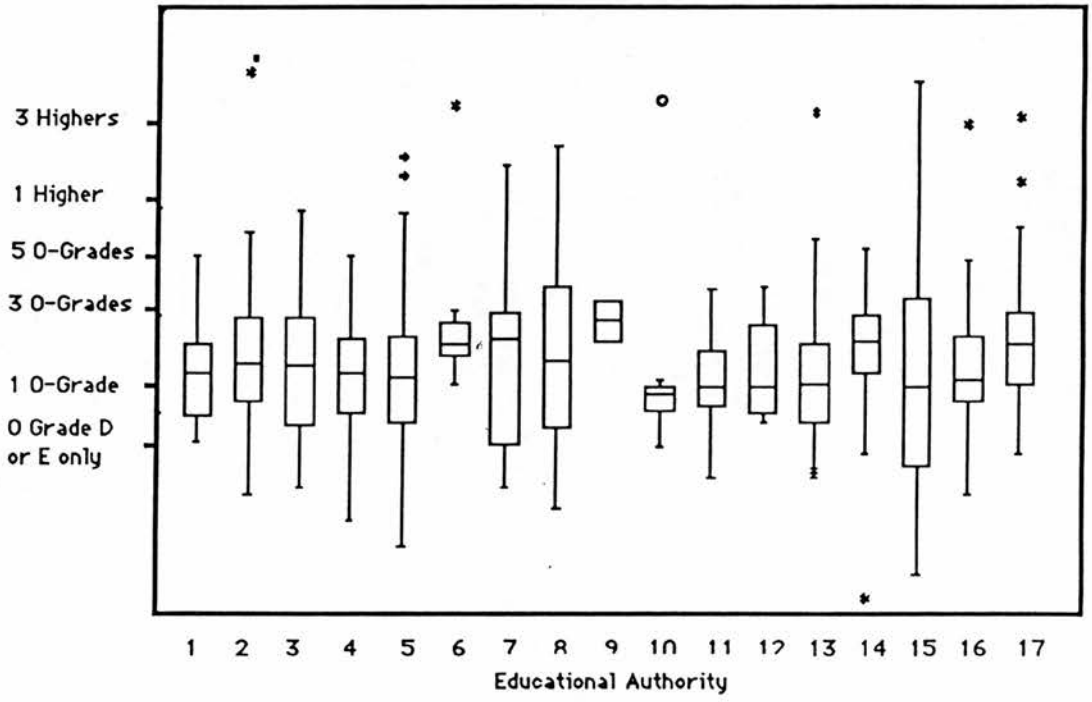


Figure 9.9a Adjusted estimates of overall SCE attainment by Educational Authority: all schools



Educational Authorities

1	Highland	9	Orkney & Shetland
2	Grampian	11	Western Isles
3	Tayside	12	Argyll & Bute
4	Fife	13	Ayr
5	Lothian	14	Dunbarton
6	Borders	15	Glasgow
7	Central	16	Lanark
8	Dumfreis & Galloway	17	Renfrew

Figure 9.9b Adjusted estimates of English attainment by Local Authority: all schools

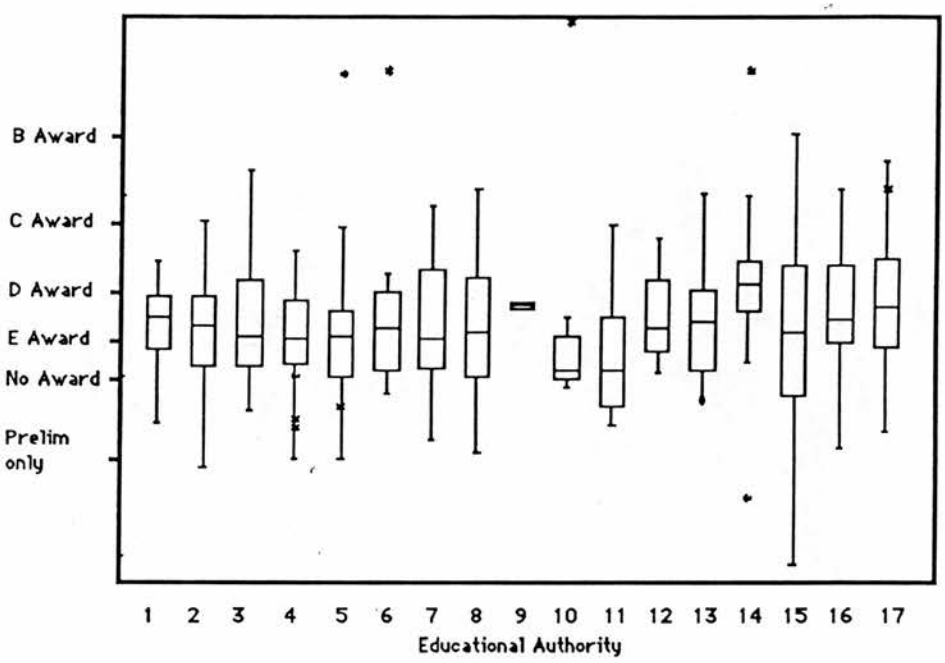


Figure 9.9c Adjusted estimates of arithmetic attainment by Local Authority: all schools

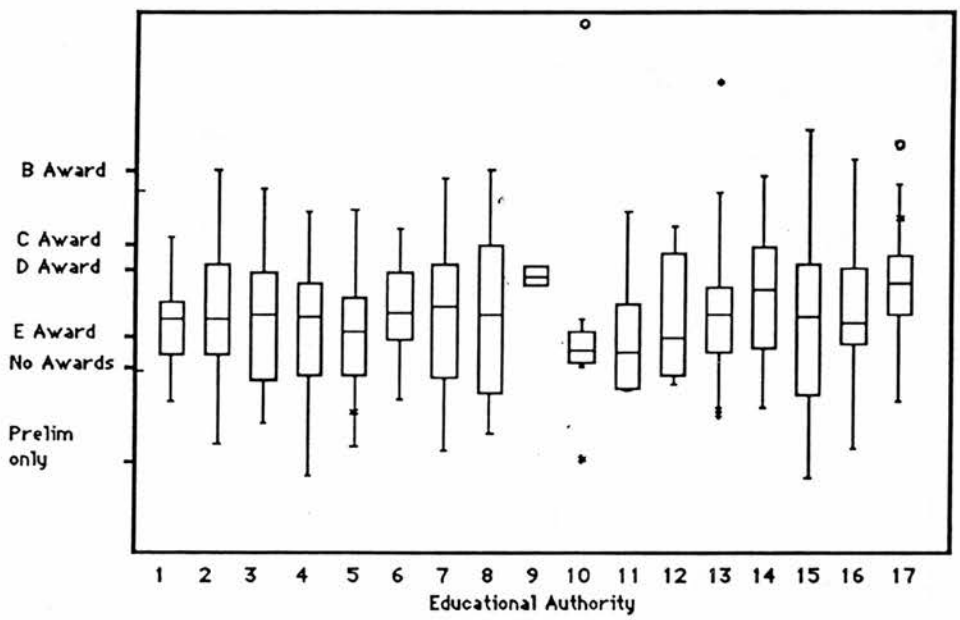


Fig 9.10

Figure 9.10 Distribution of pupils within communities: by selectivity of schooling

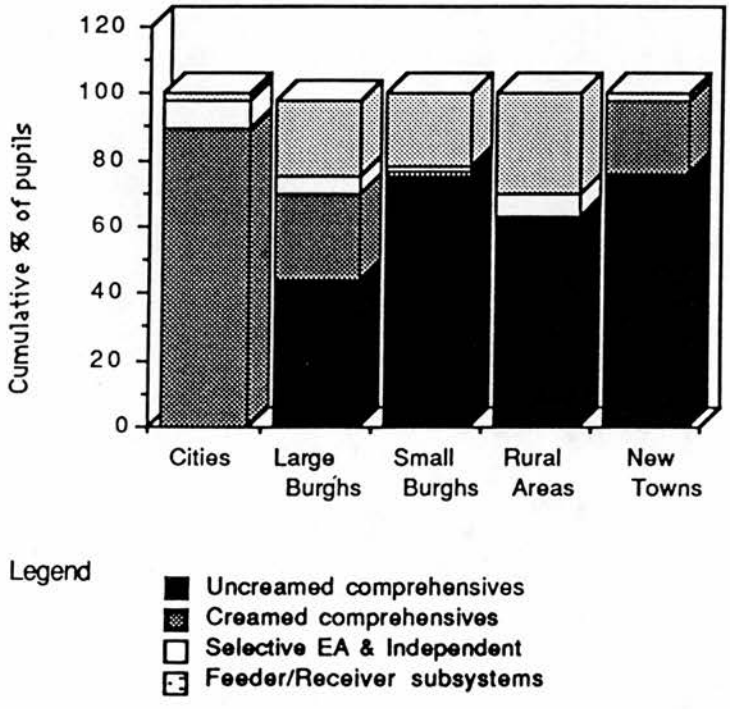
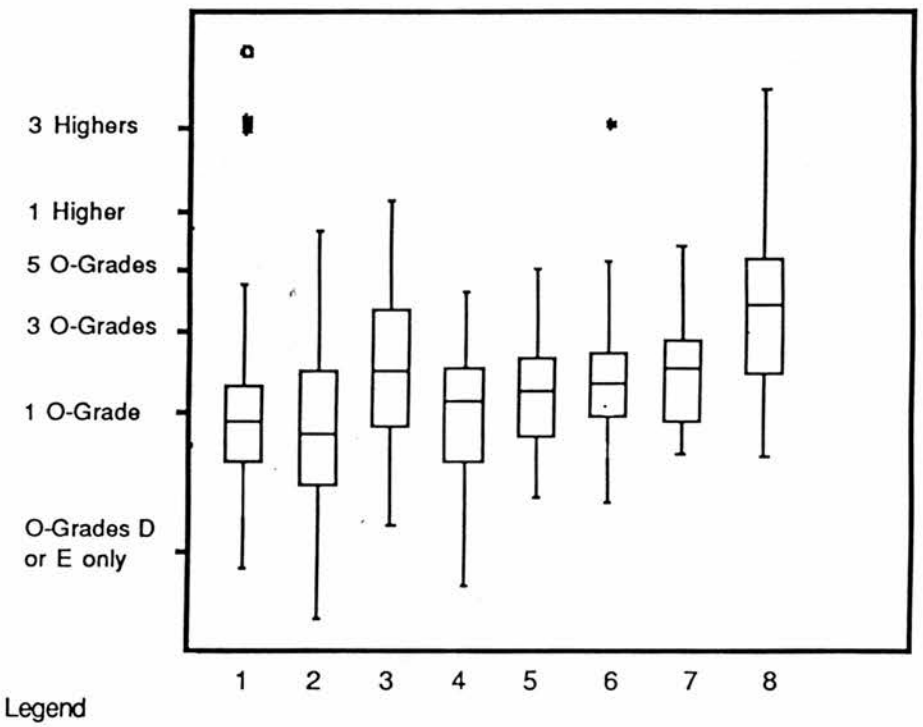


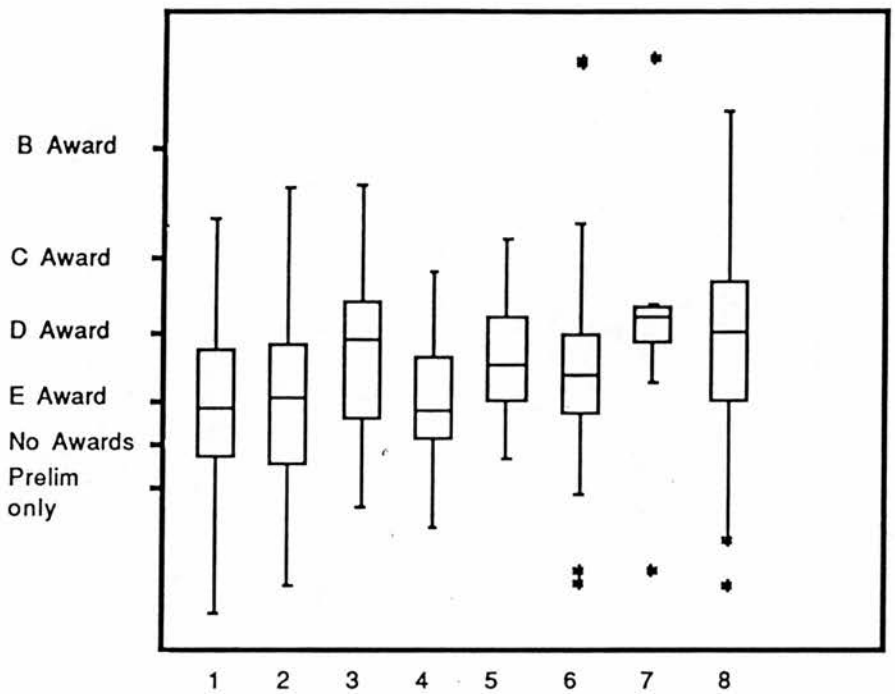
Figure 9.11a Adjusted estimates of overall SCE attainment for schools classified by selectivity and community type



Legend

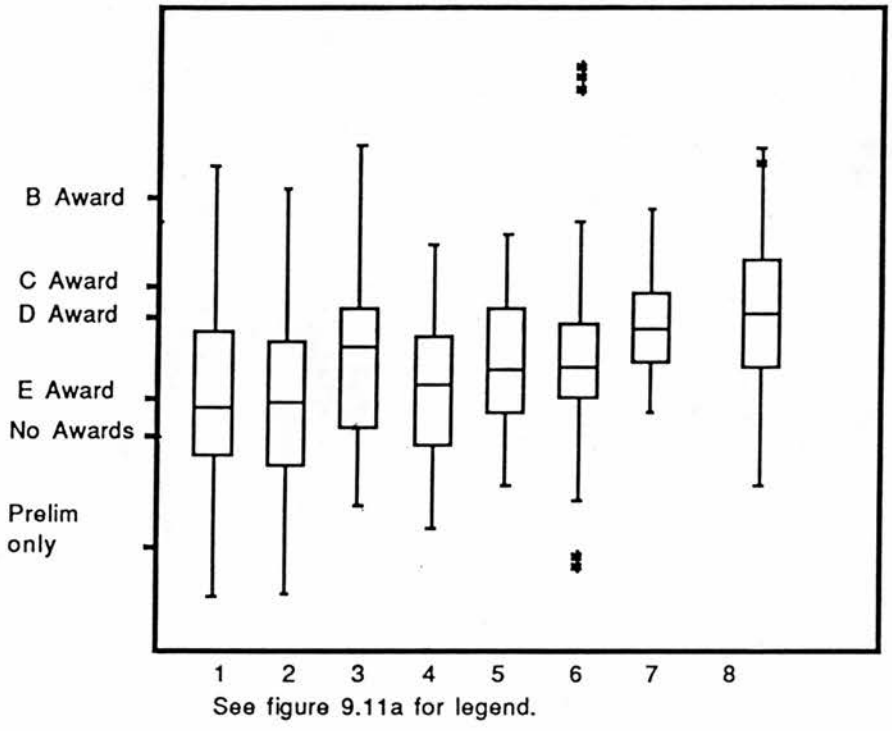
1 Feeder/Receiver subsystems
2 City creamed comprehensives
3 Large Burgh creamed comprehensives
4 Rural uncreamed comprehensives
5 Large Burgh uncreamed comprehensives
6 Small Burgh uncreamed comprehensives
7 New Town uncreamed comprehensives
8 Selective EA & Independent

Figure 9.11b Adjusted estimates of English attainment for schools classified by selectivity and community type



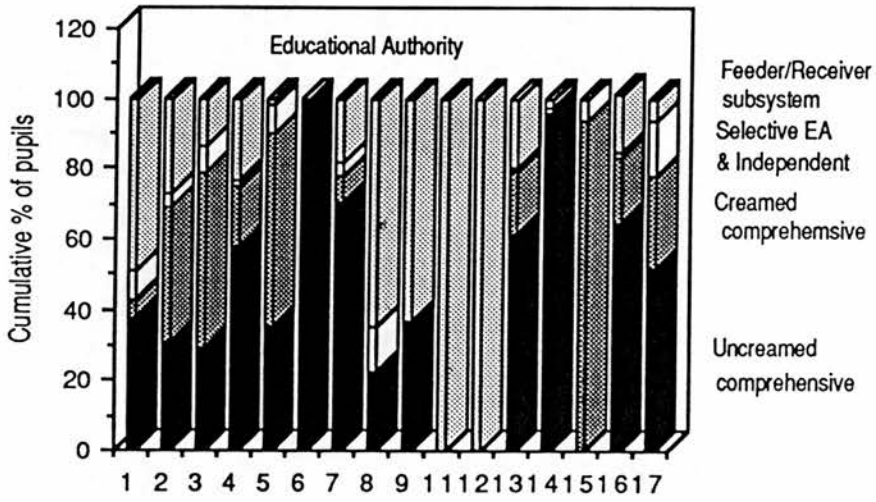
See figure 9.11a for legend.

Figure 9.11c Adjusted estimates of arithmetic attainment for schools classified by selectivity and community type



See figure 9.11a for legend.

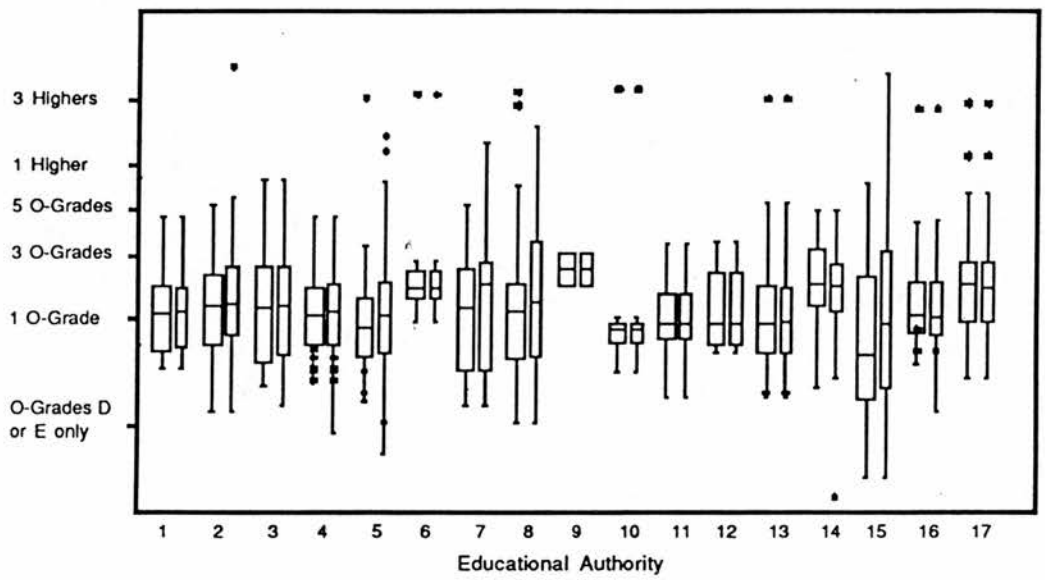
Figure 9.12 Distribution of pupils among schools of varying degrees of selectivity: by educational authority



Educational Authorities

1	Highland	9	Orkney & Shetland
2	Grampian	11	Western Isles
3	Tayside	12	Argyll & Bute
4	Fife	13	Ayr
5	Lothian	14	Dunbarton
6	Borders	15	Glasgow
7	Central	16	Lanark
8	Dumfreis & Galloway	17	Renfrew

Figure 9.13a Adjusted estimates of overall SCE attainment by Local Authority: EA schools only



Educational Authorities

1	Highland	9	Orkney & Shetland
2	Grampian	11	Western Isles
3	Tayside	12	Argyll & Bute
4	Fife	13	Ayr
5	Lothian	14	Dunbarton
6	Borders	15	Glasgow
7	Central	16	Lanark
8	Dumfreis & Galloway	17	Renfrew

Fig 9.13b

Figure 9.13b Adjusted estimates of English attainment by Local Authority: EA schools only

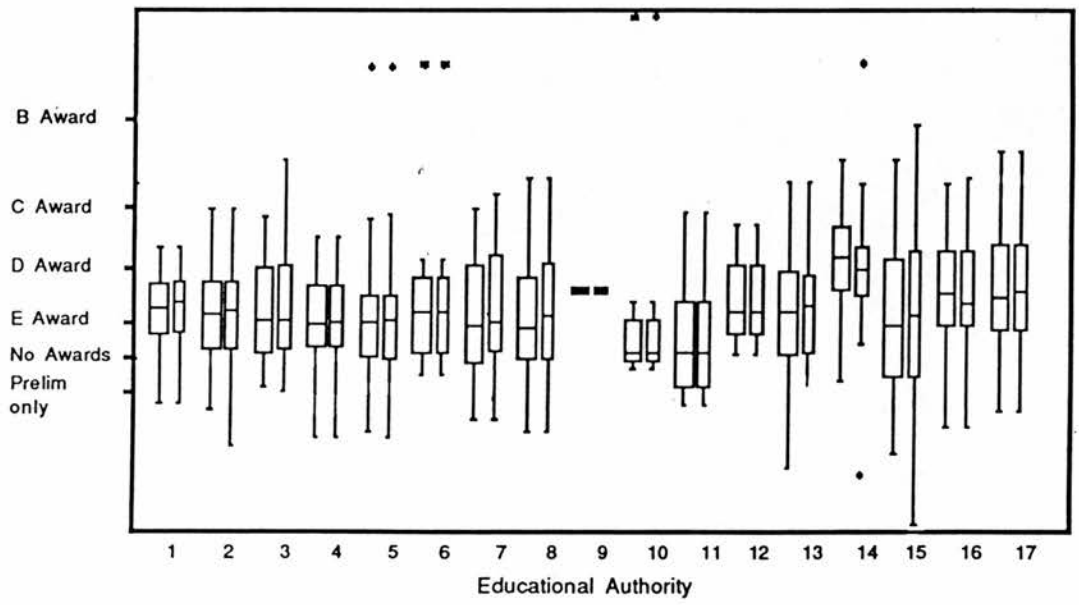


Figure 9.13c Adjusted estimates of arithmetic attainment by Local Authority: EA schools only

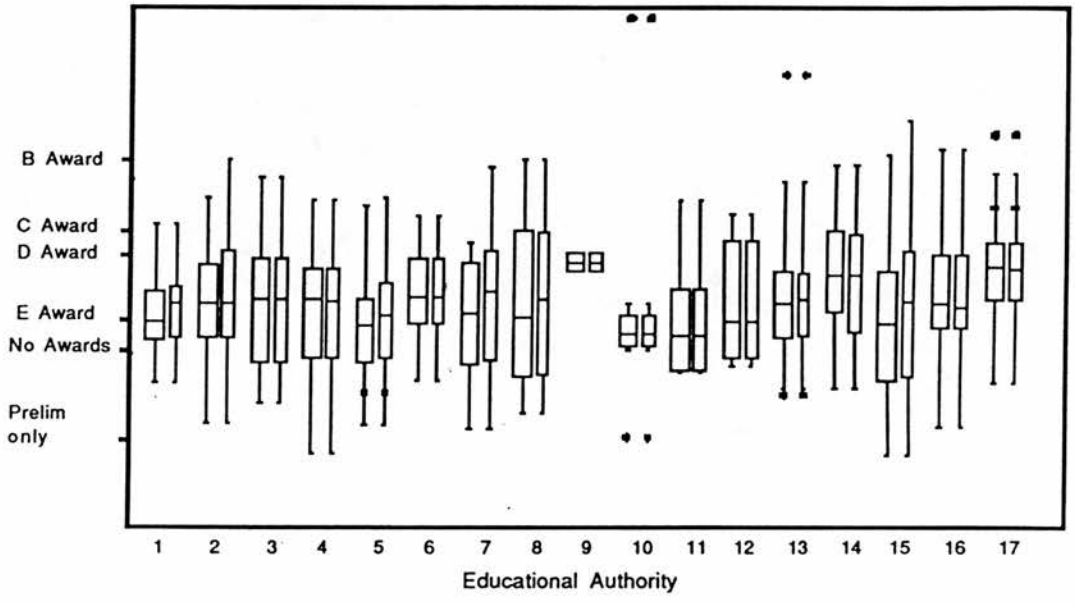
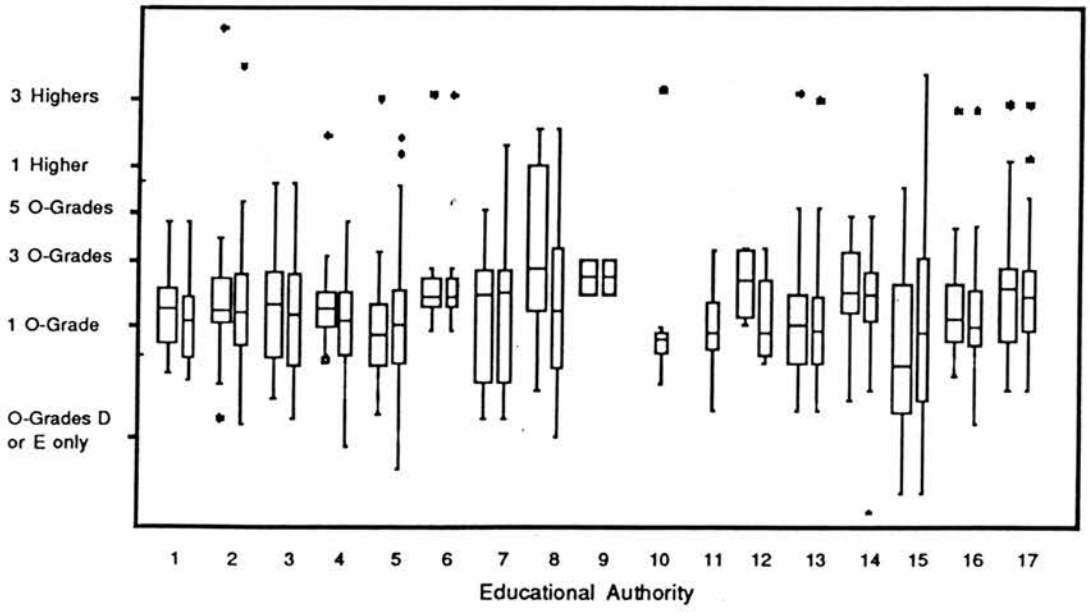


Figure 9.14a Adjusted estimates of overall SCE attainment by Local Authority: EA six-year schools only



Educational Authorities

1	Highland	9	Orkney & Shetland
2	Grampian	11	Western Isles
3	Tayside	12	Argyll & Bute
4	Fife	13	Ayr
5	Lothian	14	Dunbarton
6	Borders	15	Glasgow
7	Central	16	Lanark
8	Dumfreis & Galloway	17	Renfrew

Figure 9.14b Adjusted estimates of English by Local Authority: EA six-year schools only

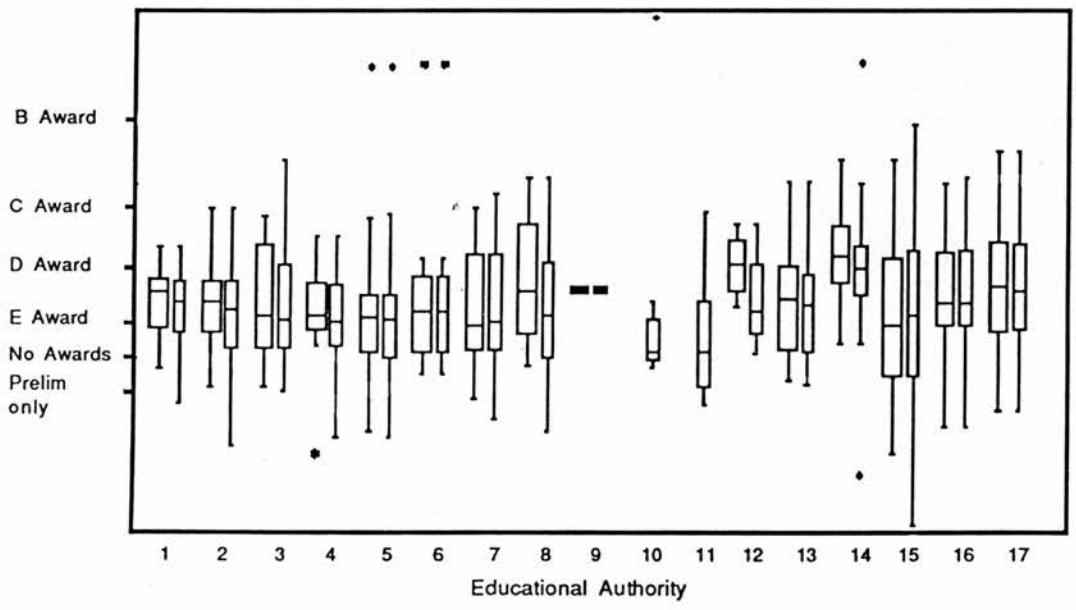
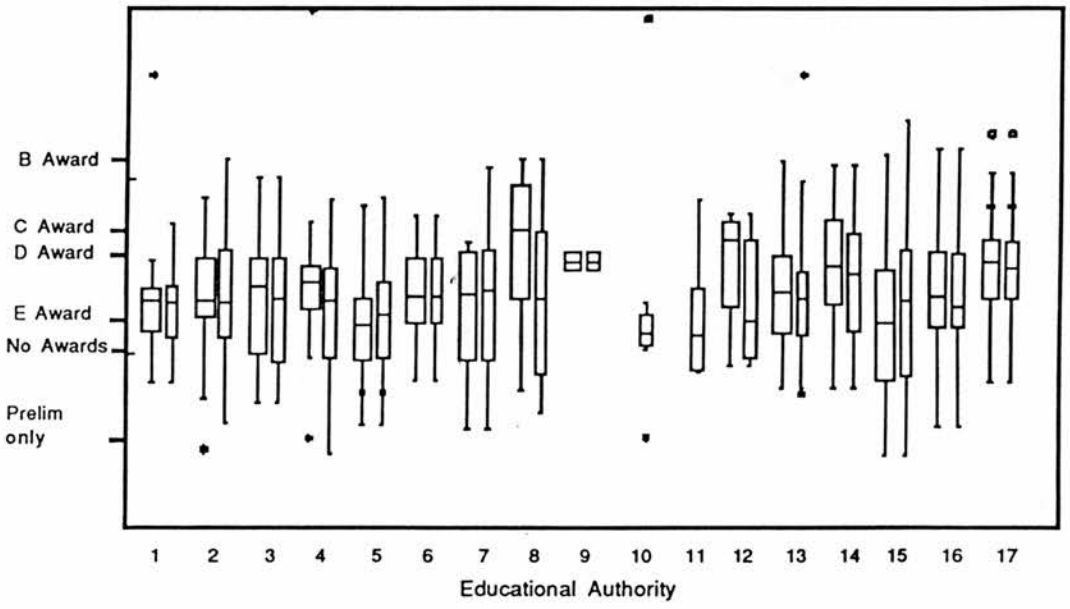


Figure 9.14c Adjusted estimates of arithmetic attainment by Local Authority: EA six-year schools only



Figures 9.8a and 9.8b show the variation in the within-authority distributions of pupil social class and attainment on leaving school. Overall the proportion of pupils from manual social class backgrounds is 71 percent, with a range among authorities from 81 percent down to 60 percent. The three authorities with the highest proportion of pupils from manual social class backgrounds are Glasgow (82%), the Western Isles (76%), and Lanark (74%), while the three with the lowest proportion from manual backgrounds are Argyll and Bute (60%), Highland (64%), and Dumbarton (65%). These variations are generally reflected also in the distribution of unadjusted pupil attainment on leaving school, as shown in figure 9.8b. The proportion overall of pupils attaining less than three O-Grade passes is 57 percent, ranging from 62 percent down to 41 percent. The highest proportions of pupils leaving school with less than three O-Grade passes are in Glasgow (62%), Ayr (53%), and Lothian (53%), while Argyll and Bute (41%), Orkney & Shetland (41%), and Grampian (44%) have the lowest proportions leaving with less than three O-Grade passes. From figure 9.8c it would appear that the authorities with a higher proportion of their pupils leaving with less than three O-Grade passes than might be expected, given the proportion of their pupils from manual social class backgrounds, are: Lothian and Ayr, while Orkney and Shetland, Dumfries and Galloway, and Renfrew have higher levels of aggregate attainment than might be expected given their social class composition.

Figures 9.9a-c show the variation in attainment for schools within each authority. These plots show that the median level of attainment in most authorities is very close to the overall median, that is, that there is little systematic variation associated with educational authorities. The information in table 9.1, however, indicates that the variation in the attainment of pupils among authorities is statistically significant. Further, the median level of effectiveness among schools within some authorities deviates significantly from the overall median for all schools in the population, across all three outcomes. The range of

variation in the authority school medians is actually about the same as the inter-quartile spread between all schools for the overall SCE outcome and for fourth year English, but it is somewhat less than this for fourth year arithmetic. This variation is equivalent to about two O-Grade passes on the overall SCE measure, and in fourth year English and arithmetic the difference between the median for the authority with the highest attainment and that with the lowest attainment is equivalent to the difference between a D-grade and a C-grade award. The inter-quartile range of variation on each outcome exceeds this within several authorities. For the overall SCE outcome the authorities with the widest inter-quartile spread are: Tayside, Central, and Glasgow. On the fourth year single subject outcomes these same authorities are among those with the largest inter-quartile spread in attainment among their schools. The widest inter-quartile spread on the fourth year arithmetic outcome is for Dumfries and Galloway, which also has a wide overall spread of attainment among its schools on the other two outcomes. For each outcome the full range of variation among authorities is large. The asterisks[6] indicate that the effectiveness for some schools is exceptional even in the context of that for other schools in the respective authority.

Orkney, Dumbarton, and Renfrew have medians that are consistently above the national median on all three outcomes, and Grampian and Lanark are also above or only just below the national median on all three outcomes. Lanark was shown earlier to have one of the highest proportions of manual social class pupils and it had the fourth highest proportion of pupils leaving school with less than three O-Grades. However, the findings in figures 9.9a-c show that this authority is about average in attainment on all three outcome measures. This highlights the problems of attempting to assess the effectiveness of authorities, or schools, on the basis of simple aggregate-level indicators of their performance, such as the estimates of mean attainment in figure 9.8c..

The information in table 9.1 suggests that there is no significant variation in slopes for the four covariates among authorities. There is only the one statistically significant slope

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6 The asterisks mark schools that are outliers in the distribution for each authority.

parameter, for social class on fourth year arithmetic outcomes, and the remaining eleven are all non-significant.

The interaction of effects among sectorial divisions in the system

An earlier section discussed the interdependence of the three sector typologies that have been employed thus far. The effectiveness of the individual sectors within each typology may influence the findings of effectiveness among sectors in other typologies. For example, the type of school that pupils attend may vary by the type of community in which they live. Figure 9.10 shows that in the mid-seventies almost all pupils in the cities attended comprehensive schools that were potentially creamed of their more able and socially advantaged pupils, while the majority of pupils in the small burghs, rural areas, and New Towns attended comprehensive schools that were uncreamed. This figure also shows the location of the feeder/receiver system in the burghs and rural areas. This subsystem had evolved specifically to provide post-compulsory schooling for pupils from small burghs and rural areas where post-compulsory classes were too small to be viable. A composite classification of schools can be derived from the cross-classification of schools among the two typologies describing the types of community in which schools are located, and their selectivity. Although there are thirty-five potential new classifications of schools in this composite classification many are empty or contain few pupils in the present data. For example, there are no city comprehensives that are classified as uncreamed, and only the one creamed comprehensive rural school. For the purposes of the current analyses, the selective and the feeder/receiver school sectors were designated as groups independent of the type of community in which they were located. The purpose of the latter group of schools is explicitly to serve a catchment which extends across communities, and the whole country may legitimately be regarded as the catchment for the former group. Among the other potential

categories of schools, all but six contained fewer than nine schools and were omitted from the analyses. Figure 9.11a-c show the variation in attainment for schools in the resulting eight categories of schools.

There is a clear pattern across all three outcomes for these eight categories of schools. The median attainment of schools increases from left to right in each figure, with one significant exception. The large burgh creamed comprehensives outperform uncreamed comprehensives in all communities, including uncreamed comprehensives in large burghs. The combined feeder and receiver subsystem of schools has one of the lowest median levels of attainment across all three outcomes. Among the uncreamed comprehensive schools, those in the New Towns had the highest median on all three outcomes, although they were few in number. The reason for the reversal between 9.6a-c and 9.9a-c in the ranking between New Town schools and those in the burghs lies in the fact that the four New Town schools that were represented in the categories of school omitted from the present composite analysis were schools which had not at the time achieved full six year, status or were creamed.

The information in table 9.1 for this cross-classification of typologies indicates that there is statistically significant variation among sectors in the mean attainment of pupils, and that the slopes for the regression of social class on pupil attainment also vary systematically across these sectors. There is also evidence that the slope for mothers education varies among these sectors for the fourth year outcomes, but not for overall SCE attainment.

Figure 9.12 shows an interaction between a classification based on local authorities, and one based on the selectivity of schools. Two authorities (Borders and Dumbarton) are found to have almost all of their pupils in the uncreamed comprehensive sector, while a further five (Fife, Central, Ayr, Lanark, and Renfrew) had more than half of their pupils in such schools. In contrast, all pupils in the Western Isles and in Argyll and Bute

attended schools that were organised as a feeder/receiver system, and more than half of the pupils in Highland, Dumfries and Galloway, and Orkney & Shetland, attended schools that were organised in this way. A majority of pupils in Glasgow, Tayside, and Lothian attended schools that were potentially creamed of their most able and socially advantaged pupils by selective EA and Independent schools. Thus, any attempt to assess the level and range of the effectiveness of schools within educational authorities must recognise the potential confounding of effects that relate to the authorities themselves with that due to the mix of school types that they contain.

The variation in attainment in each authority for all schools located within the authority (ie. EA plus non-EA schools), and for EA schools excluding those that were not full six year schools is shown in figures 9.13a-c, and 9.14a-c, respectively[7]. Figure 9.13a-c suggest that if all schools are included in the assessment of the effectiveness of the authorities schools, then those authorities which have a significant proportion of their pupils in selective schools, which were in the main the Independent schools, are advantaged in comparison with those authorities which have few pupils attending such schools. The Independent schools have higher levels of mean attainment in this analysis, but as indicated earlier a significant element in their estimated advantage lies in the fact that their pupil intakes have higher levels of prior attainment than schools in other sectors. Hence, the higher adjusted estimates of attainment for such schools should be interpreted, at least in part, as an artifact of the nature of their intakes, rather than attributed to the schools themselves. If the model contained a measure that controlled for the prior attainment of pupils then we would expect to observe a reduction in the relative differential between the estimates for EA and Independent schools. The authorities in which there are selective

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[7] In figures 9.13a-c and 9 14a-c the narrow boxplots are for all schools (the EA schools and the Independent schools combined). The wider boxplots are for the alternative population of schools in each set of figures.

schools in the present data are: Fife, Ayr, and Lanark (1 school each), Highland, Central and Dumbarton (2 schools each), Dumfries and Galloway (3 schools), Grampian (5 schools), Tayside and Renfrew (6 schools), Glasgow (10 schools), and Lothian (15 schools). One selective school in each of Highland, and Dumfries and Galloway, and five of the selective schools in Renfrew were under the control of the local authority, and were included among the population of schools represented by the wider boxplots in figures 9.13a-c. The differences in the median levels of attainment between the analysis based on all schools and that restricted to EA schools only are of little significance for any of the three outcomes. A failure to distinguish between the schools under local authority control and those outwith their control would result in only a minor overstatement of the median level of the effectiveness of authority schools. The main effects of including the non-authority schools in the analysis are the larger number of schools with high levels of attainment, as evidenced by the longer upper tails to the narrow boxplots in figures 9.13a-c.

Figures 9.14a-c present an analysis of attainment for local authority schools restricted to those which were all-through six-year schools at the time this cohort passed through them in the mid-seventies. The difference between this population of schools and the population of all EA and Independent schools combined are that the short-course schools, that is, schools that had not at the time established a post-fourth year intake, or which were feeder schools in the feeder/receiver subsystem, and the Independent schools. The pupils who may have attended these short-course schools but who transferred to all-through six-year schools before leaving school are included among the pupils leaving from the latter schools. The feeder schools in the earlier analysis presented in figure 9.9a-c do not have high estimates of attainment on the overall SCE measure, because they will have transferred their most able pupils to other schools. Indeed, the most effective of the feeder schools are more likely to be estimated to be the least effective in that analyses, particularly if they were highly successful in transferring a significant

proportion of their intake on to the receiver schools. Omitting these short-course schools from the analysis results in large changes in the estimates for those authorities with a substantial proportion of their pupils in a feeder/receiver school system, as the only remaining schools in the analysis for these authorities are their receiver schools. The changes affect the estimates of the median and range of effectiveness for the fourth year O-Grade measures, as well as for the overall SCE measure. Thus, the evaluation of the effectiveness of schools among Authorities is sensitive to the definition of the population of schools.

Discussion

This chapter has presented an analysis of the variation in school attainment among school sectors defined by three different typologies of school characteristics. These typologies were based on the selectivity of schools, the types of community which they serve, and the educational authorities through which they are administered. The historical analysis of the development of of the Scottish secondary education system presented in chapter 4, however, indicated that these typologies are interdependent. The selectivity of schooling for the cohort of pupils studied here reflects the progress that had been made by the mid-seventies toward a fully comprehensive system. Since that time, the transformation has been completed.[8] Thus, the findings for variation among schools of differing selectivity in the mid-seventies are not immediately transferable to the present system. The differences in attainment among schools in different types of communities was found to be related to the interaction of the selectivity of schools and community type, thus

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8 The conservative government of 1971 rescinded Circular 600 in Scotland, and the leglislation for the establishment of a fully comprehensive system in England and Wales. However, all authorities in Scotland continued to implement their plans for a comprehensive system.

it is also possible that the differential in attainment between different types of community may also have been reduced.

The typology of schools based on the selectivity of their intakes was associated with variation among sectors in their social class composition and in the aggregate level of (unadjusted) attainment of pupils. The sectors that were creamed had lower attainment profiles than the comparable uncreamed sectors. The EA selective and Independent schools had a very much higher attainment profile than all other sectors, and the feeder school sector had the lowest attainment profile. These differences in the aggregate attainment profiles among sectors, however, need not necessarily reflect differences in effectiveness between sectors. If the schools within each sector were equally effective given their particular intakes, then the differential may reflect no more than intake differences between sectors. The findings from this study, however, suggest that the median level of attainment among sectors does vary after taking account of school intakes. The largest differences in the median level of attainment among sectors occurs for the most selective sectors, with little variation between the four comprehensive sectors. There is no evidence of systematic sector-level variation in the regression slopes for the four covariates on the three measures of pupil attainment. There is some evidence that the range of variation in the mean attainment of schools is less among the schools in the uncreamed established comprehensive sector, and among the two sets of schools that comprise the feeder/receiver subsystem. Thus, the analysis indicates that there was systematic variation associated with this typology of sectors based on the selectivity of school intakes. The effectiveness of schools among these sectors varies both in terms of the median and its variation within sectors, although the major contrast is between schools that were selective and those that were comprehensive. The older established comprehensive schools appear to have been marginally more effective than the transitional comprehensive schools in terms of their median level of attainment, but there was a substantial overlap in the inter-

quartile range of attainment between the established and transitional comprehensive sectors.

The second typology classified schools according to the type of community that they served. There is a high degree of similarity among the five community types in terms of their aggregate social class and unadjusted pupil attainment profiles. The analysis of variation after taking account of school intakes indicates that there is variation in the median attainment of schools among these sectors, although it is not large. Further, in comparison with the less urbanised sectors, there was considerably greater variation in attainment among city schools. Overall there is evidence that the range of variation within community types decreases as they become less urban. The city and rural sectors had lower median levels of attainment among their schools than the burgh and New Town sectors. Although the performance of the New Town sector was initially found to be low for the the overall SCE measure, and relatively high for the fourth year outcomes, their low attainment on the overall SCE outcome was attributable to the schools in this sector that had not at the time been established as all-through six-year schools. Once these short-course schools had been omitted from the analysis, the performance of this sector on the overall SCE measure was found to be much higher. Also, once the six-year schools were separated out from the feeder/receiver schools in the rural sector the estimates of attainment in the rural sector increased, although only to a level similar to that of the city schools, which was the community with the lowest level of attainment of schools in the system.

Contrary to the general findings that the uncreamed comprehensives performed better than their creamed counterparts, the order of ranking among these sectors was reversed for schools in the large burghs, suggesting that the creamed comprehensives in the large burghs are different to those elsewhere.

The analysis of variation in attainment among educational authorities indicates that the range of variation in the median attainment of schools among authorities is of the order of two O-Grades on the overall SCE measure, and about a grade for each of the fourth year outcomes, after adjusting for pupil background characteristics. These differences were found to exist for the population of schools that are directly under the control of the authorities.

The findings of variation associated with schools of varying selectivity and in different types of communities indicates that the estimates of attainment within authorities are not sensitive to the particular population of schools studied. If schools that are outwith the direct control of the authorities are included along with the authority schools, then the estimates of attainment for authorities are relatively unbiased. If the population of schools is restricted to only those authority schools offering a full six-year curriculum, then the estimates for some authorities are considerably higher than for the full population of schools. The two principal sources of this variation between differently defined populations of schools are: a small number of schools that had not been fully established at the time the present cohort left school in 1980, and the four-year feeder schools within the feeder/receiver subsystem. Five of the seventeen authorities had more than half of their pupils in feeder/receiver schools in the mid-seventies when this cohort passed through the system. The estimates of the median level and range of attainment within these particular authorities are significantly affected by a decision to restrict the population of schools to all-through six-year schools, as are the estimates for authorities which contained schools that had not at the time been established as all-through six-year schools. This demonstrates the sensitivity of the analysis of authority effectiveness to the framing of the question being asked by the analysis, and to the population of schools subsequently included in the analysis. The recent analyses of local authority variation in attainment in England (Gray, 1987; Marks *et al*, 1985) have not taken full

account of the degree of selectivity that exists among schools within authorities, and the present findings raise questions about the robustness of the findings from these studies.

The analyses presented above must be qualified by the fact that the pupil-level background measures did not contain any measure of prior attainment. This may have resulted in a misspecification of the model insofar as it may have resulted in variation in the degree of control for school intakes across categories within the three sector typologies. The typology based on the selectivity of schools is the most likely to be directly affected by any such misspecification. It is probable that the pupil intakes of the more selective schools, *ceteris paribus*, have a higher level of attainment than those entering the non-selective schools. The sectors that are likely to be least affected are the uncreamed comprehensive sectors. It is not possible to estimate the proportion of the difference in attainment between the selective and non-selective sectors that is attributable to variation in the validity of the control for pupil intakes, but any interpretation of the differences between sectors must be qualified by this caveat.[9] The finding that there is an interaction between sectors based on the selectivity of schools and community types suggests that we must also be cautious in interpreting the variation between community types. Some types of community contain only non-selective comprehensive schools, while in others the schools are subject to creaming by selective schools. Although, this does not result in a significant variation in the median level of attainment in schools among different types of community, it may be the reason for the different patterns of variability within them.

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[9] The data available do contain measures of pupil VRQ for one authority, but the number of schools in each selectivity sector within this authority is too small for the sample to be of much use in assessing the relative validity of the intakes among sectors.

The estimates for educational authorities are also likely to be subject to bias due to the differential validity of intake controls. The estimates of authority effectiveness are marginally upwardly biased for some authorities when based on the population of all schools, compared to estimates based solely on authority schools. It is probable that some of this bias is due to a failure to control adequately for pupil intake characteristics in selective schools, and because these schools are concentrated within certain authorities the estimates for some authorities will be higher than they would be otherwise. Likewise, if the estimates are based only on all-through six-year schools then the estimates for authorities with a significant proportion of their pupils in four-year schools may be biased upward, since the pupil intake to these schools is, *ceteris paribus* likely to be of higher level of prior attainment after the omission of the four year schools.

The above findings of variation associated with the selectivity of schools will be formally incorporated into the models of sector variation in the next two chapters. Two strategies will be employed to take account of the influence of selectivity. First, the analyses will formally model the effects of selectivity in the context of controls for the composition of school intakes, and of the variation in school processes among schools. Second, the population of schools will be stratified into subgroups of schools that are subject to differing degrees of selectivity.

Chapter 10

Variation in Attainment Between Catholic and Non-Denominational Schools

Introduction

This chapter assess the extent of variation in mean attainment between sectors defined by the denominational status of schools. The first sections provide an overview of the provision of Catholic schooling and contrasts the problems of providing adequate facilities and staff compared to the situation in non-denominational schools, and in relation to the levels of provision required under the statutes and policies governing schooling. The following sections then present an analysis of the variation in intakes, and of the variation in attainment, between these sectors in the system of secondary schools in Scotland.

The adequacy of provision in the Catholic sector

The Catholic church's attempts to respond to the demands and pace of development in the national system led to the rapid expansion of Catholic elementary schooling between 1872 and the turn of the century. The resources of the Catholic church and of its congregation, however, were unable to keep up with advances in the national system. The pupil attendance level and the retention of pupils in post-elementary schooling lagged far behind that of the national system. Although the level of attainment for Catholic pupils in the national examinations introduced in the last decades of the century was comparable to that of pupils in the national system, this was accompanied by a much lower presentation rate for pupils in the Catholic sector. In 1876-77 only 7 percent of Catholic sector pupils were over the age of twelve years, whereas 16 percent of the pupils in the state sector were of this age, and in 1886-87 the proportion of pupils ten years of age or over who were in standards one to three was

39 percent in the Catholic sector as against 23 percent in the state sector (Treble, 1972). This difference in the pattern of leaving and attainment was partly due to the relatively disadvantaged background of pupils in the Catholic sector, which had a preponderance of pupils from unskilled and semi-skilled families (Fitzpatrick, 1986). During the next two decades, however, this differential was reduced simultaneously with progress in raising standards: in 1886-87 the proportion of pupils over twelve years of age was 11 percent in the Catholic sector and 16 percent in the state sector, and by 1907-08, soon after the compulsory age of attendance had been raised to fourteen years of age, it had climbed to 20 percent and 23 percent, respectively (Treble, 1972).

The numbers of pupils in the Catholic sector had increased from 12,000 in 1872 to 33,000 in 1882, 58,000 in 1902, and to 94,000 in 1918-19 when the Catholic schools joined the national system. During this period the number of grant aided Catholic schools rose from 65 in 1872, to 138 in 1882, 188 in 1900, and stood at 226 when the sector joined the national system (Treble, 1972). The number of Catholic schools offering post-elementary education, however, had increased to only 14 by 1914, most of which were run by the various religious teaching orders that had come to Scotland (Dealy, 1945). The economic strain of responding to the progress made by the national system and in meeting the statutory requirements administered by the Scottish Education Department was particularly acute with respect to the growth in the numbers of pupils in post-elementary schooling. By 1912 the Catholic schools were unable to offer places to all pupils who wished to enroll in supplementary classes and elementary classes larger than the statutory maximum of fifty pupils were not uncommon.

In the early years after the Catholic sector entered the national system the sparseness of the Catholic population in some areas, along with a general decline in the Catholic birth rate in the early 1920s and a reduced inflow of Catholics to the South-

West, meant that the immediate problems in providing accommodation were not those of a rapidly expanding system, but rather those of geographical imbalances in the provision of Catholic schooling. In Lanarkshire the Catholic population was increasing, and there was still inadequate accommodation in parts of Glasgow. The high unemployment of the late 1920s, and relatively buoyant labour market of the late thirties and war years both had the effect of inducing pupils to leave school early and kept the number of Catholic pupils in schools lower than they might have been.

However, these downward pressures on the demand for accommodation in Catholic schools were offset by the need to establish centralised Catholic advanced division schools and secondary schools under the Codes introduced between 1920 and 1924. The proportion of Catholic pupils receiving some secondary schooling increased from 5 percent in 1922 to 18 percent in 1939. Similarly, there was a rise from 10 percent in 1924-25 to 13 percent in 1932-33 in the proportion receiving post-elementary schooling in advanced division schools (Treble, 1972).

Between 1918-23 226 Catholic elementary schools were transferred to the national system. Some of the schools offering post-elementary education also transferred, but others elected to remain independent of the national system. Section 9 of the 1918 Act provided for voluntary secondary schools under independent management to receive government funding at the same level as the state schools, provided certain conditions were met. In 1924-25 there were 14 recognised Catholic secondary schools in Scotland. By 1923-33 this had risen to only nineteen (Treble, 1972). Of the 14 existing in 1924-25, nine were managed by the religious teaching orders. As the system of Catholic secondary schools expanded, the role of the religious teaching orders diminished. The increasing number of lay teachers employed in schools run by the orders and the establishment of new schools that were staffed entirely by lay teachers, many non-Catholic, were the two main reasons for this decline in the influence of the

religious teaching orders. Non-Catholic teachers were increasingly employed in Catholic schools to meet the shortages of staff in particular curriculum areas. In the West they were less in evidence, but in other areas the non-Catholic teaching force in Catholic secondary schools was between one third and half (Payne and Ford, 1977).

The post-war period have seen a steady narrowing of the gap in facilities and staffing between the Catholic and non-denominational sector although there was still a disproportionate representation of Catholic schools among the worst affected: "many schools,....especially Roman Catholic schools, were clearly understaffed by any reasonable standard, and this showed itself in numbers of reported vacancies, high pupil-teacher ratios, large classes, and in some cases high turnover, curtailed curriculum, and part-time education" (SED, 1970). Although pupil-teacher ratios (PTRs) are not readily available for the Catholic secondary school sector for the immediate post-war period, Treble (1972) shows them to be 18.5:1 in Lanarkshire in the early 1970s when this comment was written. The Catholic sector still had a lower staffing level a decade after the announcement of comprehensive reorganisation. The PTR for Catholic secondary schools in 1975 was 16.4:1 compared to 14.8:1 in non-denominational schools[1]. This was despite the fact that Catholic schools were disproportionately represented in areas of greatest social deprivation and were thus significant beneficiaries of the the SED's designated area schemes that provided additional funding for staffing schools in deprived areas. In the early 1970s fifteen of Glasgow's nineteen Catholic secondary schools were accorded designated status (Treble, 1972).

In 1980 the number of Catholic secondary schools was 81, taking 20 percent of the pupils in the national system. The deficit in relation to recommended staffing levels was 4.7 percent in the

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[1] Source SED Statistical Bulletin No 5/B1/1977.

Catholic secondary sector in 1975, compared to a surplus of 3.1 percent in non-denominational schools, but the gap had almost closed by 1980 when the excess over recommended levels was 5.1 percent in the Catholic schools, and 6.7 percent in the non-denominational sector.

Variation in effectiveness

Other research

The debate during the last five years about the effectiveness of public and private schooling in the United States has in essence been a debate about the differentials between the Catholic and public school sectors. Two major reports on this research (Coleman, Hoffer, and Kilgore, 1983; Coleman and Hoffer, 1987) have suggested that pupils in the Catholic schools attain at higher levels than those in the public sector. A plethora of studies attempting to counter this inference have appeared[2], and more recently the debate has focussed on the magnitude of the differential between these sectors (Alexander and Pallas, 1985; Hoffer, Greeley, and Coleman, 1985; Jencks, 1985; Willms, 1985). However, Jencks is probably correct in concluding that "[J]uniors and seniors learn slightly more in Catholic high schools than in public high schools. .... [and that]..the evidence that Catholic schools are especially helpful for initially disadvantaged students pupils is quite suggestive, although not conclusive" (Jencks, 1985; pp134).

Lee (1986) reported that three factors explain a significant proportion of the variation in the estimates of school quality and equity between the sectors. These factors are: (1) the social context of schools, as measured by the mean socioeconomic

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[2]Chapter 3 covered this debate in more detail.

status of their pupil intakes, (2) the academic and disciplinary climate, and (3) curicula offerings and requirements. Bryk *et al* (1984) also indicated that curicula differences may be associated with the differentials between these sectors. Raudenbush and Bryk (1986) have also shown that the differences in pupil test scores between Catholic and public sector schools in the United States are related to the socioeconomic composition of the schools.

Coleman, Hoffer, and Kilgore (1983) argued that Catholic schools in the US are more egalitarian than public schools, which they suggest is evidence that the Catholic schools fit the description of the *common school* ideal, better than the public schools. They concluded that the Catholic schools had higher overall levels of attainment, after allowing for differences in intake, and that this advantage was most pronounced for lower-SES pupils. Raudenbush and Bryk (1986) investigate this hypothesis with an analysis based on a multilevel model of the type discussed in chapter 5 They concluded that the common school hypothesis does hold up under more rigorous investigation. However, they found that differences in the mean SES of schools, and the amount of homework that pupils did could account for almost all of the sector differences in mean pupil attainment. The differences in sector slopes for the regression of attainment on pupil SES, however, remained even after these additional pupil-level, and school-level variables had been added to the model. The interaction between the mean SES of schools and sector did not explain these differences in the within-school equity differentials between the sectors. Pupil SES had a stronger effect on attainment in higher SES schools, and they conclude that "the difference in the strength of the SES-achievement relationship is primarily a within-school phenomenon. Had we found the reverse-ie, if the difference between sectors in the strength of the SES-achievement relationship were restricted to the between-school model it would be much more difficult to posit a school effects

explanation. Rather, a selection explanation, in which the difference in the SES-achievement relationship is a result of differences between sectors in the processes by which individuals are assigned to schools, would be much more plausible." (1986, pp13).

These so called, context effects of the influence of mean of the socioeconomic status of schools on pupil attainment, have also been investigated in relation to differences in the effectiveness of Scottish Catholic and non-denominational schools by McPherson and Willms (1986). They found that the Catholic schools in Scotland were more effective than those in the non-denominational sector, and that the difference was equivalent to more than one SCE Ordinary grade examination A-C pass at the terminal point of schooling for leavers in 1980. Furthermore, they reported that the Catholic schools had more working class intakes and that if the socioeconomic composition of schools was taken into account then the Catholic school advantage was considerably more than one Ordinary grade pass. Their study did not seek to explain these differentials between the sectors in terms of the differences in the organisational or process related characteristics of schools.

The present study

The analyses below address three issues in relation to differences between the effectiveness of Catholic and non-denominational schools in Scotland. First, it re-estimates the differentials in effectiveness between Catholic and non-denominational schools. The McPherson and Willms study estimated the differential in attainment for a nationally average pupil, but in doing so it did not allow for variation in equity differentials between schools. A failure to simultaneously model both quality and equity may lead to incorrect estimates of the differentials between sectors (Raudenbush and Bryk, 1986). Further, the previous study employed a regression analysis model

which can be shown to underestimate the standard errors for the parameters in the model when data are clustered within units such as schools (Goldstein, 1987). Although the standard errors in the former study were small in relation to the parameter estimates there is still the risk of interpretational errors in relation to the differentials between sectors. In addition, the classification of schools employed by McPherson and Willms was crossed on this dimension with a second factor indicating the stage of development of the system in which each of the schools was founded. Thus, a formal contrast and test of the difference in effectiveness between the Catholic and non-denominational schools was not attempted. The present study also investigates the relationship of school-level compositional characteristics and school process characteristics to differences in equity and quality among schools in the two sectors. More specifically, the analysis assess the contribution of school intake characteristics and of school processes to differentials in attainment between these sectors.

Analyses

The analyses presented below are grouped into three sets: (1) a description of variation in pupil characteristics and their within sector distribution between the two sectors, (2) estimates of the differentials in school effectiveness both within and between sectors, and (3) models of the heterogeneity of quality and equity among schools in the two sectors.

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Figure 10.1 Distribution of pupils by school denomination

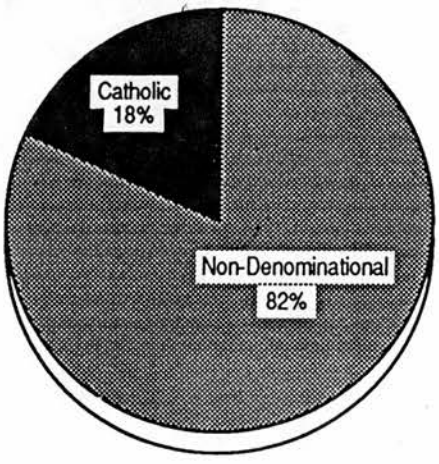


Figure 10.2 Distribution of social class within sectors

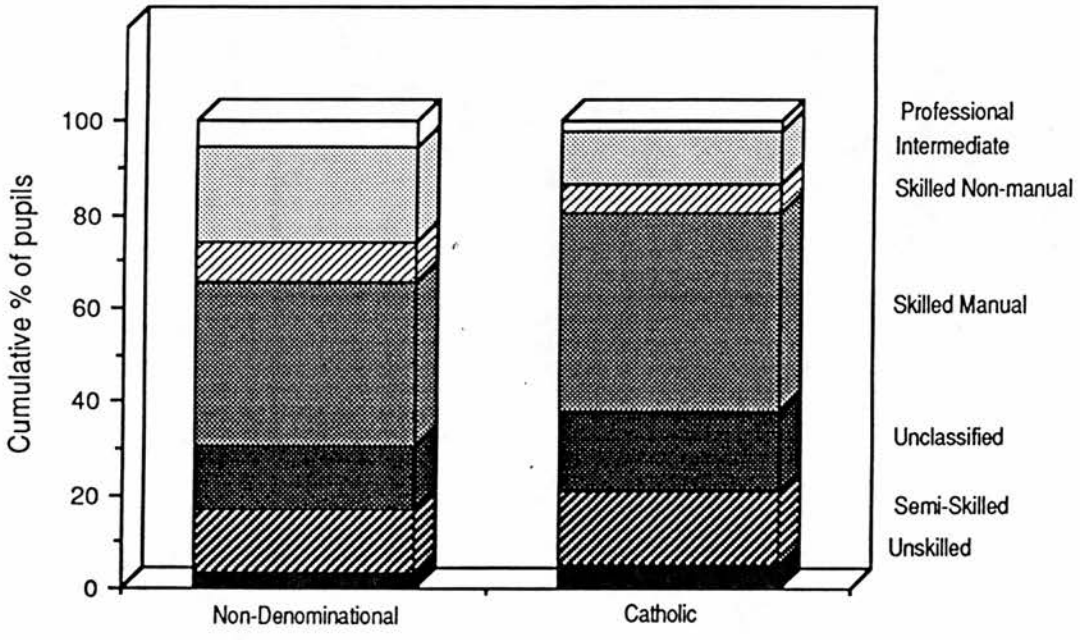


Figure 10.3a Characteristics of school intakes: mean & standard deviation

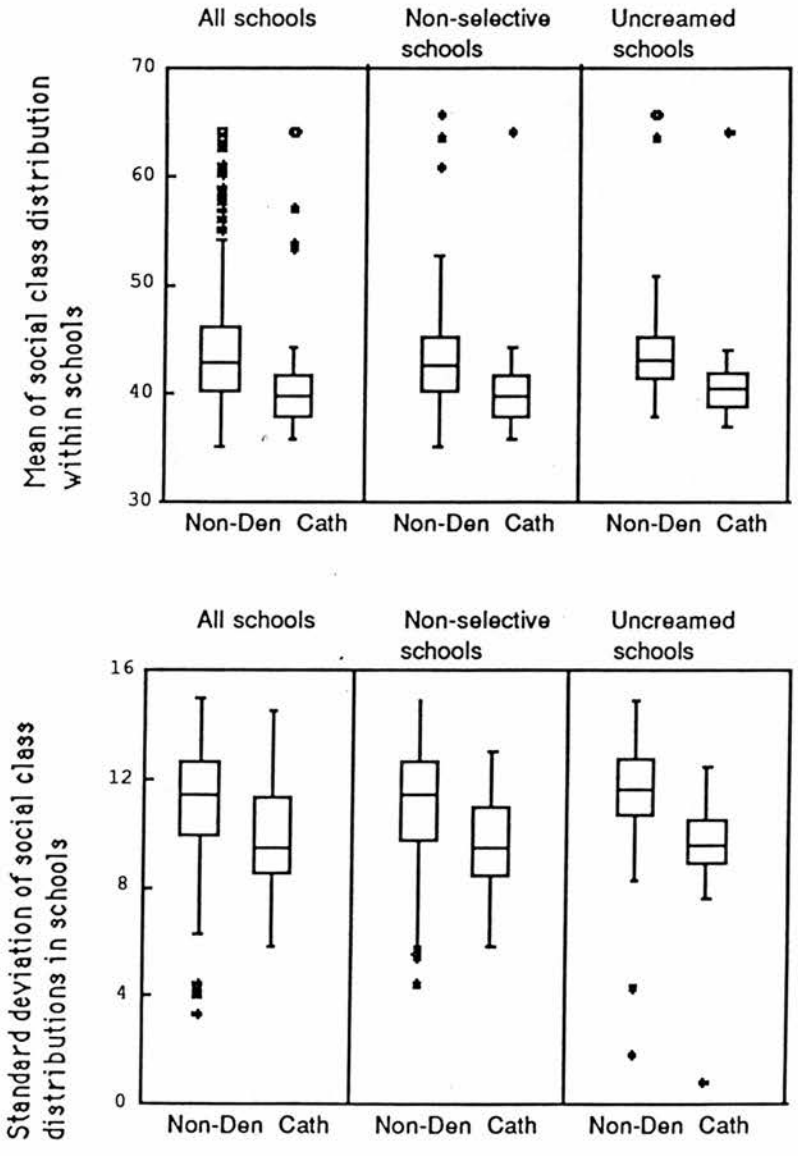
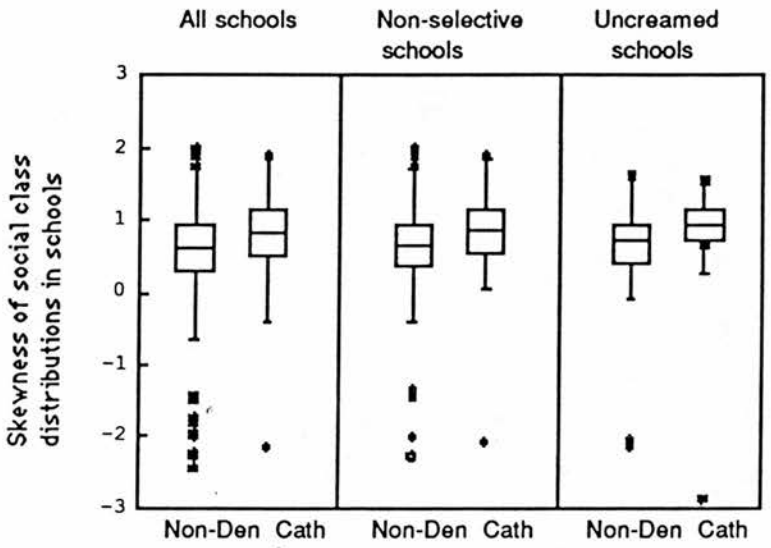


Figure 10.3b Characteristics of school intakes: skewness and kurtosis of the distribution



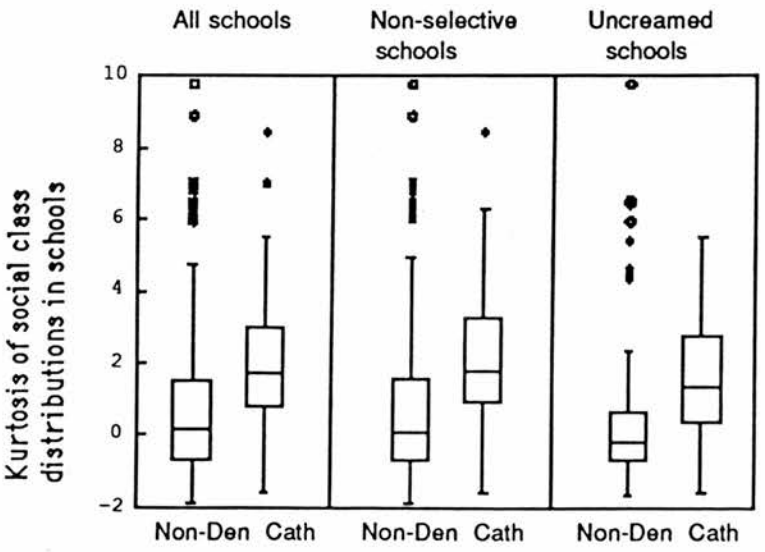
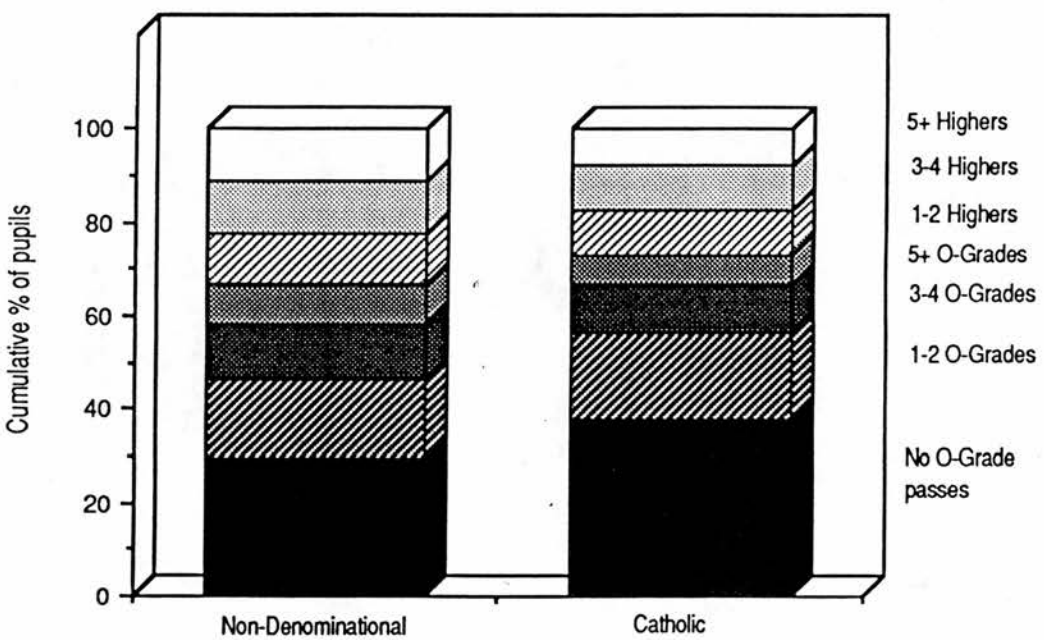


Figure 10.4 Distribution of attainment within sectors



Within sector variation in pupil characteristics

Figure 10.1 shows that the last school attended by slightly less than one fifth of the leavers from all Scottish schools in 1980 was a Catholic school. The aggregate social class distribution of pupils was more disadvantaged in the Catholic sector than in the non-denominational sector; 66% of pupils in non-denominational sector and 81% in the Catholic sector were from families where the father had a manual job (figure 10.2). The distribution of the characteristics of the social class intakes to schools for the sample comprising all schools in the data are contained in the left panels of figures 10.3a and 10.3b . Schools in the Catholic sector were on average more disadvantaged than those for the non-denominational sector, with few schools having an average pupil social class profile above that for the median school in the non-denominational sector. Further, the intakes of Catholic schools were more homogeneous than those in the non-denominational sector. This is shown by the lower standard deviation and higher kurtosis of the distribution for the intakes to the Catholic schools, however, there was also higher positive skewness in the Catholic sector school intakes. Taken together, these figures indicate that Catholic schools had intakes that were on average more disadvantaged, and that there was a greater concentration of pupils from a narrow range of social classes within these schools, although they were also more likely to have some representation of pupils from a broad range of social classes. Although the extent of formal and informal selection in the allocation of pupils to Catholic secondary schools is not known, this social class profile within and between schools is not inconsistent with a system of systematic selection based on pupil attainment levels at entry to the system. The fact that this difference between sectors in the pattern of the distributional characteristics of school intakes remains constant for the non-selective subgroup of schools, and for the subgroup of schools

that were classified as uncreamed, suggests that it reflects structural differences between the sectors.

Although the forgoing has indicated that there are differences in the distribution of social class among schools within these sectors, the aggregate within sector distributions of attainment on the overall SCE measure are relatively similar (figure 10.4). The proportion of pupils gaining one or more Highers was 33 percent in the non-denominational sector, and 27 percent in the Catholic sector. However, there was a wider differential in aggregate outcomes between the two sectors among pupils who gained no SCE Ordinary grade passes. Thirty-eight percent of the leavers from Catholic schools failed to gain any examination certificates at this basic level, while the proportion is lower at 30 percent in the non-denominational sector.

School process

Between-sector variation in the process factors for the twelve constructs with the strongest relationships to mean attainment is now analysed. Of these twelve constructs, eight can be considered to represent primarily school based process factors; with the remaining four representing either non-school factors, or measures of the social outcomes of schooling. The distribution of each of these factors among schools within each sector is shown in the boxplots in figures 10.5a and 10.5b. The median levels for the first four Instructional Factors are higher in the Catholic schools, although in two of the four comparisons the differences are probably not statistically significant. The construct *extra teaching by a paid tutor* has a considerably less skewed distribution in the Catholic sector, although there is no difference in the median level between sectors. Schools in the Catholic sector were more likely to have higher proportions of their pupils who had truanted in the last two years of compulsory schooling.

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Figure 10.5a Distributions of school process constructs by sector: Instructional factors

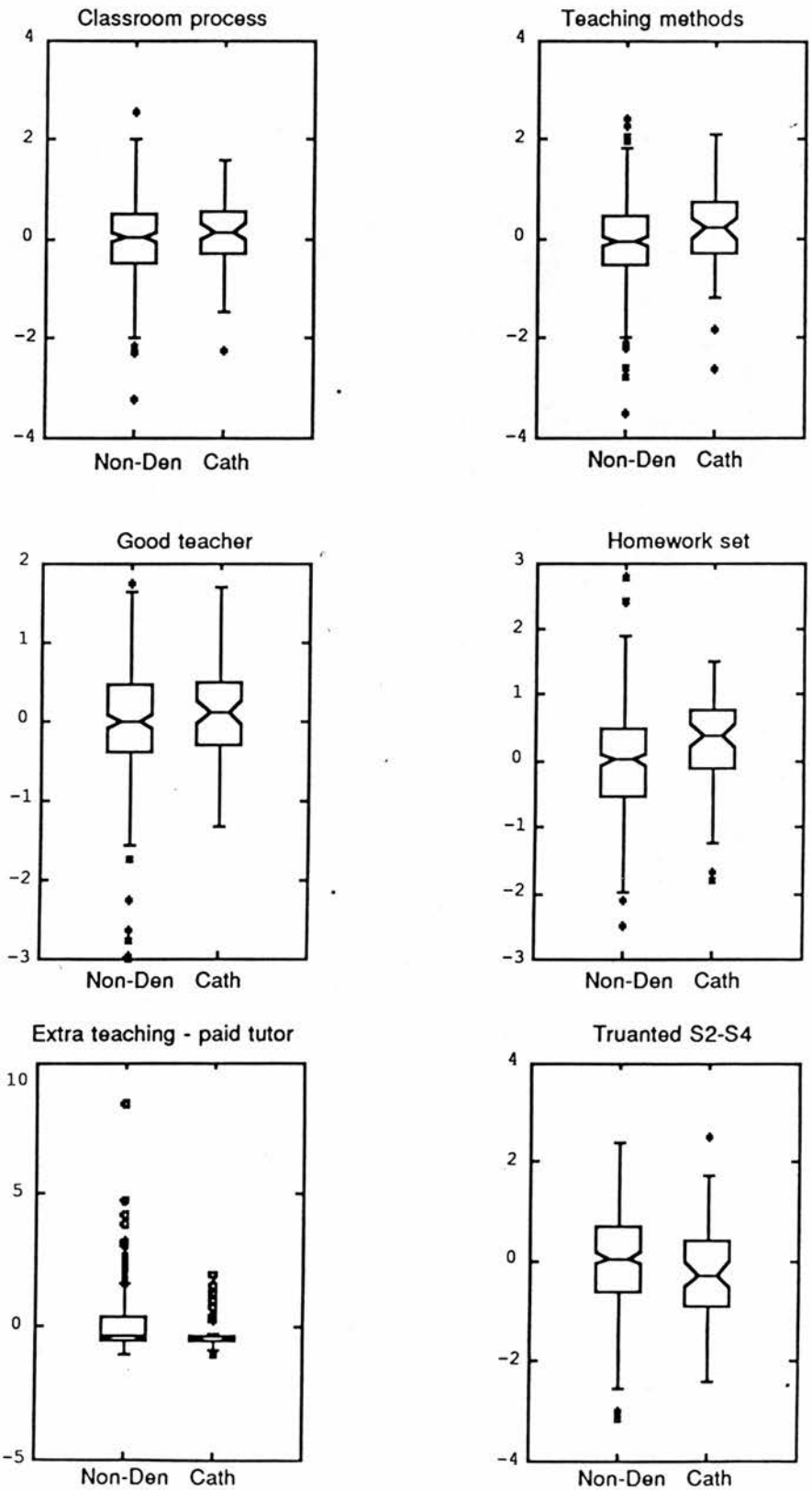
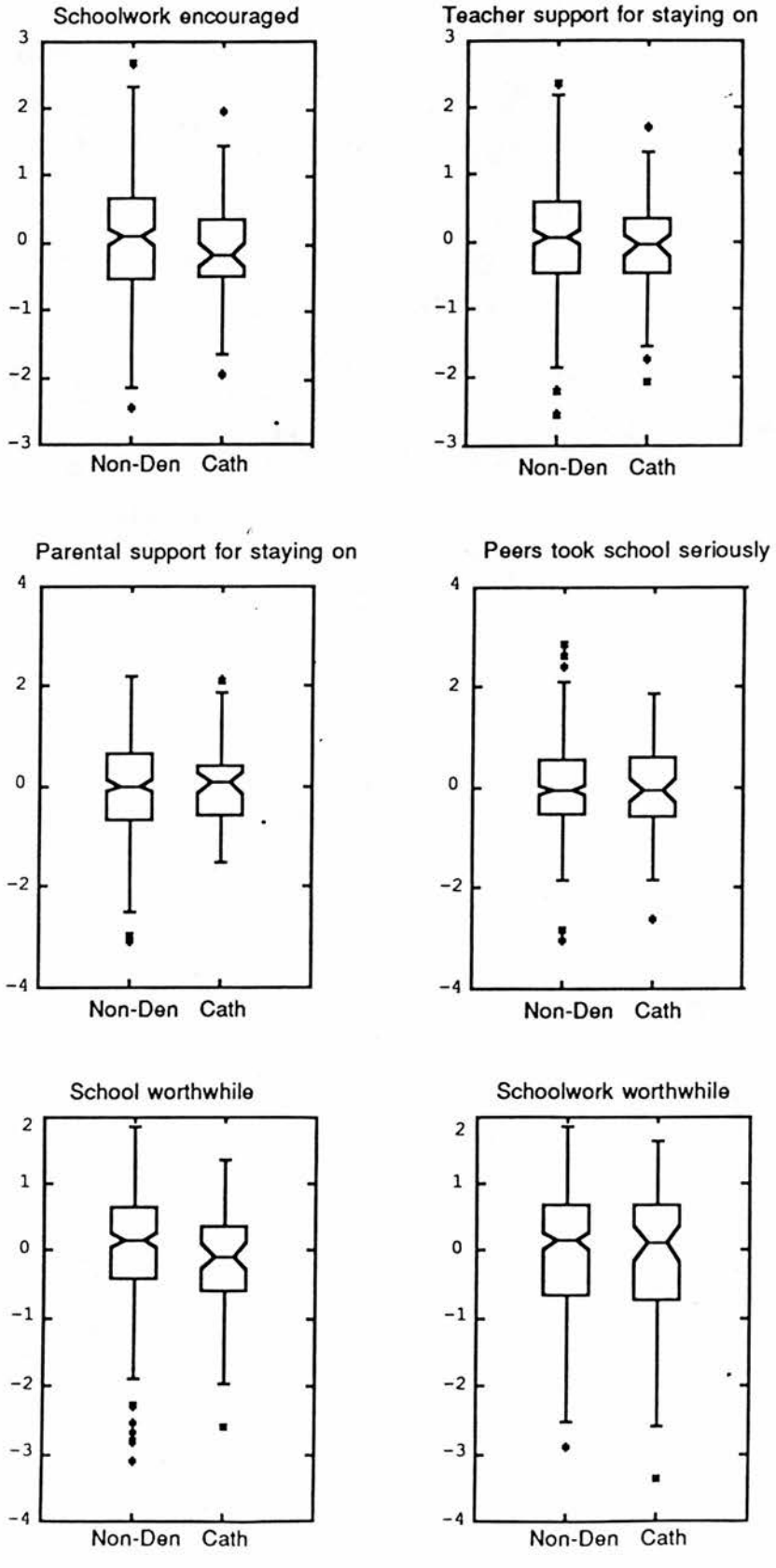


Figure 10.5b Distributions of school process constructs by sector: Influence of significant others & social outcomes



For two of the four constructs indicating the influence of significant others, the Catholic sector has a lower median. The constructs for which this is the case are: *school work encouraged (by teachers)*, and *teacher support for staying-on.* Pupils in the Catholic sector were slightly more likely to report parental support for staying on at the end of fourth year, and there was no difference between the sectors in respect of the median level on the factor indicating that *friends took school seriously.*

The two constructs indicating the pupil's evaluation of their schooling, *school worthwhile,* and *schoolwork worthwhile*, suggest that pupils in the Catholic sector had a slightly lower evaluation of their schooling than those in the non-denominational sector.

Overall the differences between the sectors do not appear to be large compared to the variation that exists within each of the sectors. However, there is evidence that the Catholic sector schools may offer a more favourable instructional climate than that found on average in the non-denominational sector. These comparisons make no adjustment for the more favourable intakes that the preceding section found to exist in the non-denominational sector.

Estimates of sector differentials in attainment

The first estimates of the differential in attainment between these two sectors is based on the initial model that Raudenbush and Bryk (1986) employed in their analysis of differences between public and private schools in the United states. In this model the covariates are centred about their within-school means, thus the model estimates quality as the unadjusted mean for each school. These estimates therefore take no account of between school differences in the two sectors, and there is no explicit modelling of the sectors. Formally, the model is specified by the following set of equations.

The *within-school model* is:

$$y_{ij} = \alpha_{j0} + \alpha_{j1}(X_{ij1} - x_{j1}) + \ldots + \alpha_{j4}(X_{ij4} - x_{j4}) + \varepsilon_{ij} \qquad 10.1^{3}$$

and the *between-school* model is:

$$\alpha_{j0} = \delta_0 + \mu_{j0} \qquad 10.2$$

$$\alpha_{jk} = \delta_k + \mu_{jk} \qquad 10.3$$

where, 10.3 is repeated for each of the k = 1, 2, 3, 4, slope parameters in 10.1. This is simply a pooled within-schools model that treats school intercepts and slopes as random effects, and it will be referred to as the null-sector model. The estimates from this null model provide a base against which to gauge success in explaining between school variation through the inclusion of sector and school process factors in later analyses.

Figures 10.6a-c are based on the above estimates of the unadjusted mean attainment for schools, and the notches about the medians provide an approximate 95 percent confidence interval for a test of sector differences in median levels of mean attainment. For all three outcomes the notches overlap the two sector medians, which suggests that there is no statistically significant differential in average pupil attainment between the Catholic and non-denominational sectors. For the overall SCE measure, and for arithmetic, the median for the non-denominational sector is slightly higher than that for the Catholic sector, but for English the latter sector has the higher median. The variation in average attainment in schools appears to be considerably greater in the non-denominational sector for all outcomes. In comparison with the Catholic sector there tend to be many more schools of relatively high or low attainment in this sector. *.....text recommences, after figures, on page 313*

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[3]Lower case x_{jk} represents the within school mean for upper case X_{ijk}.

Figure 10.6a Variation in unadjusted outcomes by school denomination: overall SCE attainment

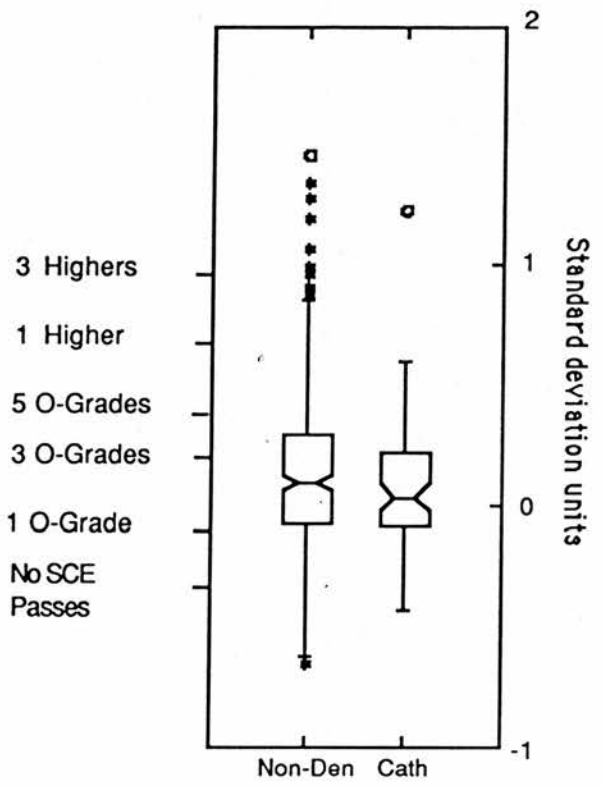

Figure 10.6b Variation in unadjusted outcomes by school denomination: fourth year English attainment

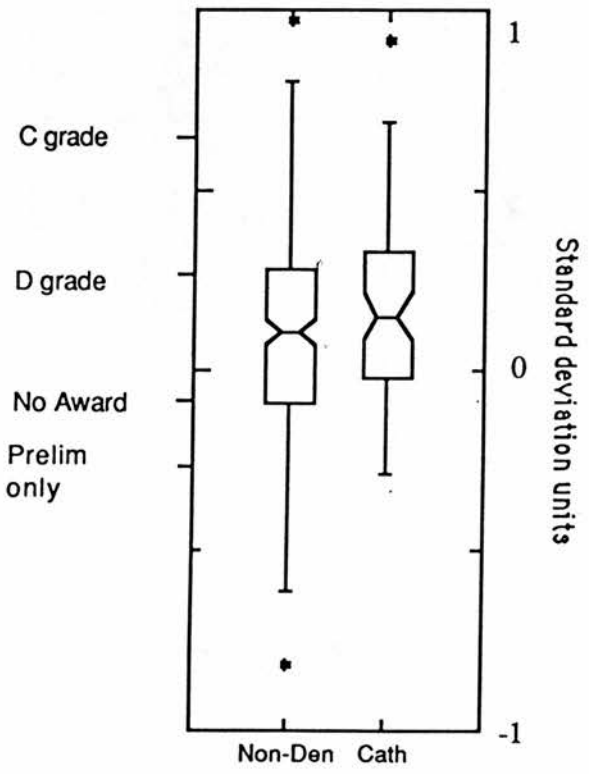

Figure 10.6c Variation in unadjusted outcomes by school denomination: fourth year arithmetic attainment

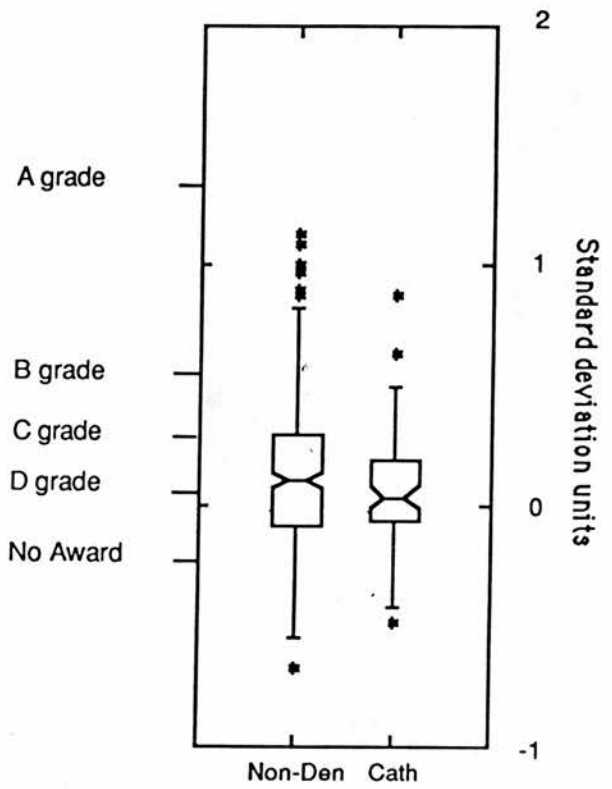

Table 10.1 Parameter estimates for the unadjusted model of variation in pupil attainment

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean Attainment	.194	.024	.146	.021	.158	.020
Social Class slope	.027	.001	.023	.001	.024	.001
Mothers Education slope	.294	.020	.268	.019	.255	.020
Siblings slope	-.113	.005	-.117	.006	-.114	.049
Gender slope	.056	.017	.323	.018	-.062	.018
Fixed sector effects for Catholic schools:						
Mean Attainment	-.140	.057	-.028	.049	-.135	.048
Social Class slope	-.001†	.002	.000†	.002	-.000†	.002
Mothers Education slope	.041†	.047	.047†	.048	.014	.049
Siblings slope	.068	.011	.063	.011	.069	.012
Gender slope	-.024†	.040	-.093	.041	-.001†	.043

† coefficient not statistically significant at the .05 level.

Note on structure of tables

The tables reporting the results of the modelling contain information on the effects of school-level variables (including sector and selectivity indicators) on the mean attainment of schools and on the covariate slopes in schools. The school-level indicators are modelled as fixed effects, and are referred to as such in the tables. The estimates of parameters are grouped together under the headings for each of these fixed effects in a model. The effect of schools on the level of attainment of pupils (ie. the school mean) and the slope estimates for the contrast sector, or for the pooled sectors not explicitly specified, in each model (non-denominational schools in the above table) are referred to as the 'Fixed mean effects'. The effects for the sector(s) which are explicitly modelled are referred to as the 'Fixed sector effects for XXX sector'. The effects for the other school-level factors, such as the selectivity indicators, are referred to by name, eg. the 'Fixed effects for uncreamed schools'. The coefficients printed are the estimates of these school-level fixed effects on the mean attainment of schools, the γ_{j0} in equation 10.4, (referred to as 'Mean Attainment'), and on the covariate slopes, the γ_{jk} in equation 10.5, (referred to as the effects on 'Social Class slope', for example).

Table 10.1 presents estimates of the differential in average pupil attainment between sectors. These results are based on the above model which has been augmented by the inclusion of an indicator variable to describe the sectors. This requires a respecification of the between-school model in 10.2 and 10.3 above. The *between-school* model becomes:

$$\alpha_{j0} = \delta_0 + \gamma_0 S_j + \mu_{j0} \qquad 10.4$$

$$\alpha_{jk} = \delta_k + \gamma_k S_j + \mu_{jk} \qquad 10.5$$

where, S_j is coded 0 for Catholic schools and 1 otherwise, and again the second equation, 10.5, is repeated for k = 1, 2 , 3, 4, to represent each of the slopes in 10.3. Thus, the variation in means and slopes among schools is now explicitly modelled by a variable (S_p) designating the sector in which a school is contained. The estimated coefficients for this indicator variable provide an estimate of the differential in pupil attainment between sectors.

The mean effects of denominational status for this model, table 10.1, suggest that the Catholic sector has a lower mean level of attainment than the non-denominational sector. The difference in attainment ranges from 3 percent of a standard deviation[4] in fourth year English to 14 percent in both fourth year arithmetic, and for overall SCE attainment. The difference in

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[4]The unit of measurement employed in discussing results in these chapters is based on the the meta-analysis methodology of 'effect sizes'. An effect equal in magnitude to the standard deviation of the dependent variable is designated to be an effect of unit magnitude. The unit of measurement employed her is the standard deviation for the outcome variable, and each of the three outcome variables was first standardised to have unit variance(see Chapter 6). This provides a convenient measure, as the coefficients in the model can be interpreted as the percentage of a standard deviation increase or decrease in the outcome that would be associated with a unit change in the value of the independent variable. Also, the prior standardisation of the dependent variables to a common scale (mean = 0, variance = 1) allows effects to be compared across outcomes. One tenth of a standard deviation is approximately equal to half an of an Ordinary grade pass on the overall SCE measure, in the centre of the distribution. For each of the fourth year outcomes it is approximately equal to half of a grade in the centre of the distribution. The substantive interpretation of the scaling of these outcome variables is discussed in chapter 6.

regression slopes between the two sectors for the four pupil background measures is statistically non-significant for social class on all three outcomes, and for mothers education and gender for two of the three outcomes. The Catholic sector has a steeper slope for the arithmetic outcome on mothers education and a flatter slope for the regression of English on gender. The latter finding indicates that the differential in attainment in English between boys and girls is less in the Catholic sector, but since the mean effect for gender is positive an overall advantage for girls still remains. The main finding in relation to slope variation between these two sectors is that the slope for sibship size is flatter in the Catholic sector.

The analyses thus far suggests that there is evidence that pupil attainment is marginally lower in the Catholic sector, however, the earlier analysis indicated that schools in the Catholic sector have more disadvantaged intakes in terms of the social class of their pupils. The analysis will now be extended to provide a more rigorous test of differentials between these two sectors. First, the differences in intakes will be taken into account, and second the effects of controls for selection effects between the two sectors will be investigated.

Adjusting estimates of attainment for variation in school intakes

The first step in taking account of between-school variation in pupil attainment is to adjust for differences in pupil-level background characteristics. The adjustment undertaken now is for the pupil-level differences between schools in intakes. Adjustments for school-level differences in composition, that is, context effects, are discussed in a later section.

The model in 10.1 - 10.5 is respecified to adjust for differences in the intake of schools, which is accomplished simply by uncentering the within school pupil-level covariates..

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Table 10.2 Parameter estimates for the base model

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.120	.013	.087	.014	.112	.013
Social class slope	.029	.001	.024	.001	.025	.000
Mothers education slope	.329	.018	.281	.020	.278	.020
Siblings slope	-.121	.005	.-124	.006	-.122	.006
Gender slope	.057	.017	.329	.017	-.056	.018
Fixed sector Catholic schools						
Mean attainment	.020†	.031	.119	.032	.012†	.031
Social class slope	-.001†	.002	.000†	.002	-.001†	.002
Mothers education slope	-	-	.047†	..047	.000†	.048
Siblings slope	.074	.011	.068	.011	.075	.011
Gender slope	-.030†	.039	-.106	.041	-.009†	.042
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school						
Means	.039	1030 392	.039	941 392	.032	931 392

† coefficient not statistically significant at the .05 level.

The *within-school model* becomes

$$y_{ij} = \beta_{j0} + \beta_{j1}X_{ij1} +...+ \beta_{j4}X_{ij4} + \varepsilon_{ij} \qquad 10.6$$

and the *between-school* model is

$$\beta_{j0} = \delta_{0} + \gamma_{0}S_p + \mu_{0j} \qquad 10.7$$

$$\beta_{jk} = \delta_{k} + \gamma_{k}S_p + \mu_{jk} \qquad 10.8$$

where, again the second equation is repeated for each k = 1, 2, 3, 4 slope parameters in the within-school model. This model will be referred to as the base model.

Taking account of pupil background characteristics removes the deficit in the mean level of attainment that was found for the Catholic sector in the previous model. The estimate in table 10.2 of the main effect of the denominational status of schools on the level of pupil attainment is statistically non-significant for the overall SCE and fourth year arithmetic outcomes, but statistically significant for fourth year English. Pupils in Catholic schools attain at an average level in English that is 12 percent of a standard deviation above the average level in non-denominational schools. The effects of sector on the equity slopes of schools are generally non-significant, with the exception of the effects for the slope for sibship size. For this pupil background characteristic the slopes are flatter in Catholic schools. The inclusion of the sector variable denoting the denominational status of schools results in the explanation of all of the reliable variation in the siblings slope. However, the model does not explain all of the variation in the mean levels of attainment in schools, or of the variation in the slopes for social class and gender.

This slope variation may be associated with differential selection of pupils to schools. We might, for example, posit that schools with selective intakes would have flatter social class

slopes. In particular, if they were to select only the most able of the lower socioeconomic pupils available to them, then the equity differentials for these schools may be less than in the non-selective schools.

Selection effects and sector differentials

The analyses in chapter 9 indicated that the largest differentials between sectors of differing selectivity were those between the sector comprising the independent EA selective schools on the one hand, and the comprehensive sectors on the other. Thus, a first step in assessing the effects of selectivity influences on the effectiveness of Catholic and non-denominational schools is to include an indicator variable for schools that are formally selective in the model. The other influence of selectivity that was apparent, although to a much smaller extent, was that which indicated whether schools were creamed or uncreamed. The model is now extended to include both these selectivity effects. The indicator for the selective sector, and that for the creamed sector, are binary variables that designate the schools with the more selective intakes. They are positively coded, that is, the schools which have higher scores on these variables[5] are more selective.

The model employed for estimating the effects of selectivity on the school intercepts and slopes requires the addition of terms to 10.7 and 10.8. The *within-school* model remains as in 10.6, but the *between-school* model becomes

$$\beta_{j0} = \delta_0 + \gamma_0 S_j + \theta_0 Z_j + \Phi_0 W_j + \mu_{j0} \qquad 10.9$$

$$\beta_{jk} = \delta_k + \gamma_k S_j + \theta_k Z_j + \Phi_k W_j + \mu_{jk} \qquad 10.10$$

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[5] The coding employed was: creamed school=0, otherwise 1; selective school = 1, otherwise 0.

where, Z_j is coded 0 for creamed schools and 1 otherwise; and W_j is coded 1 for formally selective schools and 0 otherwise.

The addition of these two selectivity factors to the model has no noticeable effect on the estimates of the sector differential (table 10.3). The advantage in favour of the Catholic sector remains for fourth year English, and the sector effect for fourth year arithmetic and for the overall measure of attainment is statistically non-significant. The pattern of relationships between sector and slopes is also resistant to the effects of adding these measures of the selectivity of schools to the model.

The estimates for the two selectivity factors indicate a higher level of attainment in the more selective schools. The differences between the non-selective and selective schools in slopes for outcomes on social class indicate that they are flatter in the selective sector for the two fourth year outcomes, but not for overall SCE attainment. After taking account of the formally selective schools the uncreamed schools are estimated to have a higher level of mean attainment than the creamed schools on all three outcomes. The differential, however, is only 7-8 percent of a standard deviation. There is no evidence of any differential between the creamed and uncreamed schools in the slope for the regression of any of the outcomes on social class. Thus, once the formal selection of pupils into certain schools is taken into account there is evidence that informal selection processes result in a separate differential in mean attainment levels but not in slopes for social class.

As a separate check on these findings the analyses were also conducted on the samples of schools that were formally non-selective, and on the sample of schools that were uncreamed. The sample sizes in each of these analyses are substantially smaller than those in the analyses above, thus the test of sector differentials is, in statistical terms, less powerful. However, this analysis is important as it provides a check on the possibility that the above estimates might be affected by differences in the structure of the relationships for schools whose intakes are subject to selection.

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Table 10.3 Parameter estimates for the base model + selection

Arithmetic	Overall SCE				English	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.452	.041	.224	.043	.327	.042
Social class slope	.024	.002	.013	.002	.018	.002
Mothers education slope	.326	.016	.292	.017	.269	.017
Siblings slope	-.120	.017	-.123	.006	-.122	.006
Gender slope	.055	.017	.329	.017	-.056	.018
Fixed sector effects for Catholic schools						
Mean attainment	.020†	.030	.118	.032	.009†	.030
Social class slope	-.001†	.002	.001†	.002	-.000†	.002
Mothers education slope	-	-	-	-	-	-
Siblings slope	.074	.011	.067	.011	.075	.011
Gender slope	-.028†	.039	-.108	.040	-.008†	.042
Fixed sector effects for non-selective schools						
Mean attainment	-.394	.044	-.171	.046	-.257	.044
Social class slope	.004†	.002	.010	.003	.007	.002
Fixed sector effects for uncreamed schools						
Mean attainment	.083	.024	.067	.026	.061	.024
Social class slope	.003†	.001	.001†	.002	.001†	.001
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school						
Means	.034	1134 405	.039	1055 405	.031	1022 405

† coefficient not statistically significant at the .05 level.

Table 10.4 Parameter estimates for the base model: uncreamed schools only

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.137	.015	.123	.016	.131	.016
Social class slope	.031	.001	.026	.001	.027	.001
Mothers education slope	.367	.026	.333	.028	.306	.029
Siblings slope	-.112	.008	-.121	.009	-.119	.009
Gender slope	.076	.025	.362	.025	-.043	.028
Fixed sector effects for Catholic schools:						
Mean attainment	.012†	.038	.098	.042	.005†	.041
Social class slope	-.005†	.003	-.002†	.003	-.004†	.003
Mothers education slope	-	-	.032†	.073	.021†	.074
Siblings slope	.069	.017	.066	.018	.071	.018
Gender slope	-.007†	.062	-.115†	.066	.001†	.069

† coefficient not statistically significant at the .05 level.

Table 10.5 Parameter estimates for base model: non-selective schools only

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.059	.017	.059	.017	.070	.017
Social class slope	.029	.001	.025	.001	.025	.001
Mothers education slope	.312	.018	.304	.018	.270	.019
Siblings slope	-.127	.007	-.129	.007	-.126	.007
Gender slope	.040†	.023	.288	.023	-.071	.024
Fixed sector effects for Catholic schools:						
Mean attainment	.028†	.030	.104	.032	.011†	.031
Social class slope	-.002†	.002	-.002†	.002	-.002†	.002
Siblings slope	.072	.011	.067	.011	.076	.012
Gender slope	-.002†	.040	-.079†	.041	.028†	.043
Fixed sector effects for uncreamed schools:						
Mean attainment	.073	.023	.061	.024	.059	.023
Social class slope	.002†	.002	.001†	.001	.001†	.001
Siblings slope	.013†	.009	.007†	.010	.006†	.010
Gender slope	.035†	.031	.068	.032	.021†	.034

† coefficient not statistically significant at the .05 level.

The estimates reported in tables 10.4 and 10.5 bear a close resemblance to those in the previous analysis. There is exactly the same pattern of statistically significant differences for both mean sector effects, and for differences in slopes between Catholic and denominational schools, for these two models, with one exception. In no case does the estimate of the sector differential differ from that for the selectivity model for the full sample of schools in table 10.3 by more than 2 percentage points of the standard deviation for the outcome measure. The exception for differences in slopes is for the slope of English attainment on gender, which becomes statistically significant in the analysis for the subset of the schools that are not subject to selection effects.

The mean level of attainment for the subsample of schools that are uncreamed is higher, for all outcomes than the mean level of attainment for all schools in the state system, which confirms the result in table 10.3 that there are some additional effects associated with informal selection between schools after taking account of formal selection. The difference in the estimate of mean attainment between the creamed and uncreamed schools is of the order of 7 percent of a standard deviation for all three outcomes. The validity of the full model in table 10.3 is also supported by the estimates for the mean level of attainment for the uncreamed non-denominational schools in tables 10.4 and 10.5. The estimates of the mean level of attainment for pupils in the uncreamed schools from the full model in table 10.5 are .141, .120, and .131 for overall SCE attainment, English, and arithmetic, respectively. The estimates in table 10.4 which are for this sample of schools only are .137, .123, .131, and the estimates derived from summing the mean overall effects and the mean effects for uncreamed schools in table 10.3 are .132, .120, and .129, respectively. The high degree of correspondence between these three sets of estimates indicates that the model based on all schools with selectivity modelled through variables indicating whether schools are formally selective or creamed is as a better representation of these particular relationships in the system, than a model based on stratified subsets of the schools. The

estimates of differentials between groups of schools that are subject to selection for this larger model are the same as those obtained from the latter more restrictive models, but the former model has an advantage in that it provides a richer representation of the variation among schools in the system.

The effects of school composition on sector differentials

McPherson and Willms (1986) reported that the social class composition of schools had a direct effect on the estimates of sector effectiveness. In particular, the estimates of effectiveness for the two Catholic sectors in their study improved markedly while those for the three non-denominational sectors were reduced after the average social class of the school was included in the model. The effect of the average social class of a school has most often been interpreted as an indication that context effects associated with the intake composition of schools have an important bearing on pupil attainment. However, Hauser (1970) and others have argued that such effects are just as likely to be an indication that a full specification of selection effects has not been included in the model. As a means of testing whether there may be additional selectivity influences that are not tapped by the indicators already included in the model a measure of the mean social class of schools was added to the models developed in the above analysis. The mean social class variable was added to the sector-level model that includes the indicators for formal and informal selection, as described by 10.6, 10.9, and 10.10 above. If there are significant selection effects between sectors that are associated with the social class composition of intakes to schools, then the sector variable in this model should show a statistically significant change in magnitude. If, however, there is little effect on the magnitude of the coefficients for the sector indicator or on those for the selectivity indicators, then the average social class of schools can be interpreted as making a contribution to the variation between schools that is independent of sector and selection effects.

Table 10.6 Parameter estimates for the base model + selection + mean social class

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.231	.041	.076†	.046	.160	.043
Social class slope	.019	.002	.012	.003	.013	.002
Mothers education slope	.316	.016	.285	.017	.258	.017
Siblings slope	-.118	.005	-.117	.006	-.117	.006
Gender slope	.047	.015	.328	.017	-.059	.016
Fixed sector effects for Catholic schools						
Mean attainment	.108	.026	.185	.029	.081	.028
Siblings slope	.072	.011	.079	.012	.082	.012
Fixed sector effects for non-selective schools						
Mean attainment	-.130	.045	.023†	.049	-.051†	.046
Social class slope	.008	.002	.012	.003	.011	.002
Fixed sector effects for uncreamed schools						
Mean attainment	.038†	.021	.022†	.023	.022†	.021
Social class slope	.003†	.002	-	-	-	-
Fixed sector effects for mean social class of schools						
Mean attainment	.029	.003	.025	.003	.025	.003
Siblings slope	-	-	-	-	.004	.001

† coefficient not statistically significant at the .05 level.

The addition of the average social class of schools to the model produces a differential in the estimated attainment of pupils in favour of the Catholic sector (table 10.6). The increase in the estimate is of the order of eight percentage points of a standard deviation. The differential between sectors is statistically significant for all three outcomes. The advantage for pupils in Catholic schools is 11 percent of a standard deviation for overall attainment, 8 percent for fourth year arithmetic, and 19 percent for fourth year English.

This change in the estimates subsequent to the addition of mean social class to the model may reflect either that unmeasured selection effects were uncontrolled in the previous models, or that the context of Catholic schools depresses attainment in that sector. Some information on the possibility that this effect may be the result of undercontrol for the characteristics of pupil intakes to schools can be garnered from the behaviour of the coefficients for the indicators of selectivity in the model. The mean effect for the indicator of formal selection is substantially reduced in the present model, and is no longer statistically significant for the two fourth year outcomes. There is also a reduction in the magnitude of the coefficient for the indicator of informal selection, although the change is much more modest. Thus, there is evidence that a significant component of the effect due to the mean social class variable is associated with patterns of formal and informal selection in the system. If the effects attributable to the mean social class of school intakes are wholly attributable to selection effects which are otherwise not included in the model, then we would conclude that the level of attainment in the Catholic sector is higher than that in the non-denominational sector, and that the advantage is of the order of 10 percent of a standard deviation. The advantage of the Catholic sector will, however, be reduced to the extent that the effects of the mean social class of school intakes are jointly attributable to school based influences on attainment.

The effects attributable to school process factors are now investigated in the context of the sector model described by 10.6, 10.8 and 10.9, before considering an extended model that includes the mean social class of schools in addition to the school process factors.

Do school process factors explain the differentials between sectors ?

An earlier section described the variation in school processes between these sectors . This present section investigates whether school process factors explain the between-sector variation in attainment in fourth year English found in the earlier analyses, and the differentials for all outcomes that were found subsequent to the inclusion of the mean social class of school intakes in the model.

Of the twelve school process measures discussed earlier in this chapter, six were associated with instructional aspects of school process, four with the influence of significant others, and two with the social outcomes of schooling. The latter set of constructs will not be employed in this section as factors that might explain variation in attainment between sectors as they are just as likely to be correlates of attainment as causes of it.

The model to be employed for the analysis is of the same formal specification as that in the previous section, except the mean social class term is now replaced by a set of terms representing school process. Since the use of these statistical methods is in its infancy the optimal strategy for building hierarchical models to explain between-school variation in outcomes is still subject to exploration. The strategy adopted in this chapter is first to develop a parsimonious sector model. This involves assessing which sector indicators are to be included in the model and retaining only those that are associated with statistically significant coefficients. It is desirable to delete terms from the model where coefficients are statistically non-

significant because of the potentially complex model that would represent a fully saturated 'sector effects by school process' specification. With four covariates, three sectors, and six school process measures the saturated model would contain sixty coefficients in the *between-school* part of the model, which would be beyond any sensible attempt to model the relationships. Statistically non-significant coefficients indicate that the associated parameters do not have any meaningful variation between schools.

The school process factors relating to instruction and the influence of significant others are employed as a means of explaining the variation between sectors in fourth year English attainment. Subsequently, this set of process factors are also used to model the variation after the inclusion of the mean social class of school intakes.

After the addition of school process factors to the sector plus selectivity model estimated earlier, the model provides an explanation for about two-thirds of the between-school variation in mean attainment. More specifically, the model explains 70 percent of the variance in school mean attainment on the overall SCE measure, 43 percent in fourth year English, and 55 percent in fourth year arithmetic (table 10.7). Compared to the same model with school process factors omitted (table 10.3) the sector effect for English is reduced from .12 to .08, and remains statistically significant, but the sector effects for overall SCE attainment and for arithmetic remain statistically non-significant. The coefficients for the indicator of formal selection is substantially reduced by the introduction of the school process factors into the model. The advantage of the formally selective schools is reduced from 39 percent of a standard deviation to 21 percent of a standard deviation for the overall SCE attainment measure. The reductions are almost as large for the two fourth year outcomes, with the difference between selective and non-selective schools being eliminated for English. This suggest that some of the effects associated with school process are manifest

in differences between selective and non-selective schools. Three of the eight process factors that enter the model are associated with the influence of significant others. These may be correlated with unmeasured selection factors, particularly those associated with pupil ability, that are not included in the model. Hence, it would not be be safe to interpret this result propitiously as a direct indication that instructionally related differences in school process between selective and non-selective schools are responsible for the variation in pupil attainment. The effect of the introduction of the school process factors on the coefficient indicating informal selection are much weaker than that for the formal selection indicator, although it too is reduced.

The effect of adding the mean social class of schools to this model (table 10.8) is to further reduce the magnitude of the effects associated with the selectivity indicators. The differentials between selective and non-selective schools are eliminated for the two fourth year outcomes, and are only 9 percent of a standard deviation in overall SCE attainment. This is a very significant reduction in the estimate of mean SCE attainment between selective and non-selective schools. Before the inclusion of school process constructs and school mean social class the differential was estimated to be 39 percent of a standard deviation (table 10.3). The indicator of informal selectivity was eliminated from the model for overall SCE attainment, and is statistically non-significant for the two fourth year outcomes in the final model. As was found earlier for this model prior to the introduction of the school process variables (table 10.3), the inclusion of the mean social class of schools in the model increases the estimate of the sector effect.

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Table 10.7 Parameter estimates for the base model + selection + school process

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.309	.036	.093	.015	.206	.039
Social class slope	.022	.002	.014	.002	.018	.002
Mothers education slope	.322	.016	.290	.017	.261	.017
Siblings slope	-.120	.005	-.122	.006	-.121	.006
Gender slope	.049	.015	.311	.016	-.057	.016
Fixed sector effects for Catholic schools						
Mean attainment	.004†	.023	.081	.027	-.011†	.025
Siblings slope	.074	.011	.067	.011	.075	.011
Fixed sector effects for non-selective schools						
Mean attainment	-.213	.038			-.105	.041
Social class slope	.007	.002	.011	.002	.007	.002
Fixed sector effects for uncreamed schools						
Mean attainment	.061	.018	.046	.021	.051	.020
Fixed sector effects for school process: Instructional factors						
Teaching methods						
Mean attainment	.058	.012	.063	.014	.043	.014
Social class slope					-.002	.000
Good teacher						
Mean attainment					.044	.017
Gender slope			.080	.025		
Truant S2-S4						
Mean attainment	.027	.010			.023	.011
Extra teaching - paid tutor						
Social class slope	.001	.001				
Fixed sector effects for school process: Influence of significant others						
Teacher support for staying-on						
Mean attainment	.030†	.016				
School work encouraged						
Mean attainment			-.020†	.017		
Social class slope	.002	.000				
Parental support for staying-on						
Mean attainment	.108	.014	.116	.016	.094	.012
Peers took school seriously						
Mean attainment	.034	.012			.036	.013
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school Means	.012	723 400	.024	792 403	.015	742 400

† coefficient not statistically significant at the .05 level.

Table 10.8 Parameter estimates for the base model + selection + school process + mean social class

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.218	.038	.095	.028	.139	.041
Social class slope	.018	.002	.009	.002	.015	.002
Mothers education slope	.315	.016	.281	.017	.256	.017
Siblings slope	-.119	.005	-.121	.006	-.120	.006
Gender slope	.048	.015	.319	.016	-.058	.016
Fixed sector effects for Catholic schools						
Mean attainment	.053	.024	.125	.028	.029†	.027
Siblings slope	.073	.011	.065	.011	.073	.011
Fixed sector effects for non-selective schools						
Mean attainment	-.088	.039			-.027†	.044
Social class slope	.010	.002	.015	.002	.009	.002
Fixed sector effects for uncreamed schools						
Mean attainment			.038†	.021	.037†	.020
Fixed sector effects for the mean social class of school intakes						
Mean attainment	.016	.002	.014	.003	.012	.003
Gender slope			.015	.003		
Fixed sector effects for school process: Instructional factors						
Teaching methods						
Mean attainment	.049	.012	.049	.013	.039	.014
Social class slope					-.002	.000
Good teacher						
Mean attainment					.038	.017
Gender slope			.055	.026		
Truant S2-S4						
Mean attainment	.025	.010			.028	.011
Extra teaching - paid tutor						
Social class slope	.002	.001				
Fixed sector effects for school process: Influence of significant others						
Teacher support for staying-on						
Mean attainment	.018†	.016				
School work encouraged						
Mean attainment			-.030†	.017		
Social class slope	.002	.000				
Parental support for staying-on						
Mean attainment	.084	.014	.089	.016	.071	.013
Peers took school seriously						
Mean attainment	.026	.012			.029	.013
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school Means	.011	689 400	.022	750 402	.014	709 399

† coefficient not statistically significant at the .05 level.

However, it is statistically non-significant for arithmetic, and only 5 and 13 percent of a standard deviation for overall SCE attainment, and English, respectively. These are considerably smaller sector differentials than the 8 percent in arithmetic, 19 percent in English, and 11 percent in overall SCE attainment estimated in table 10.6 for this model prior to the introduction of the school process measures. Thus, the school process factors included in the model account for between one-third and two-thirds, depending on the outcome considered, of the sector effect after taking account of the mean social class of schools.

The school process factors are also capable of accounting for almost half of the effects associated with the mean social class of schools. The coefficient estimating the effects of the mean social class of schools is reduced by 44 to 52 percent when the school process factors are entered into the model which includes the former factor.

Discussion

The history of Catholic schooling in Scotland is one of a relentless struggle to keep up with the demands made by the continuing improvements in the public sector. Certainly many saw the entry of Catholic schools into the national system under the 1918 Act as a complete capitulation from the stance that was adopted when the national system of schooling was established in 1872. However, the incorporation of the Catholic schools into the national system subsequent to the 1918 Act did not transform the schools into the secular system that Catholics had feared. But, neither did it provide the Catholic sector with the resources and facilities that were the norm for most schools in the national system. This was due to the fact that the Catholic schools were in a fairly perilous state when they entered the national system. It was to be another five decades before staffing levels and facilities in the Catholic schools were to match those in the non-denominational schools in the national system. There were many

reasons for the continuing privation of the Catholic sector. The lack of Catholic teachers, perhaps being the most significant. This deficit was slowly overcome, mainly by the increased employment of non-Catholic staff, but it was not until the late 1970s that the staffing levels in Catholic schools were to reach parity with those in the non-denominational sector.

At that time the Catholic sector was catering for a fifth of the secondary school population in the system. The 81 Catholic schools were, as they had always been, concentrated more in areas of social disadvantage than were the non-denominational schools, and the social class profile of Catholic schools reflects this. This situation is the reverse of the social class profile of Catholic schools in the United States, and can, in large part, be traced back to the differences in social and economic status of the populations that emigrated from Ireland to these two destinations in the mid nineteenth century.

The recent debate about the effectiveness of Catholic and public schooling in the United States has focussed on two issues. Coleman, Hoffer, and Kilgore (1983) found that the Catholic sector had a higher level of attainment, and that the equity differential was lower in that sector than in the public sector. Although these findings provoked a fierce academic response they have not been overturned, although the consensus would probably now be that the advantage in mean attainment in favour of the Catholic sector is relatively small. Three sets of factors have been shown to explain a significant proportion of the differential between sectors: the mean socioeconomic status of schools, curriculum differences, and academic and disciplinary climate.

The variation in the mean social class of schools has also been shown to be related to the differential in attainment between the Catholic and non-denominational sectors in Scotland (McPherson and Willms, 1986). They found that attainment in Catholic secondary schools was higher than that in non-denominational schools, particularly once the mean social class

of schools was taken into account. Catholic schools have a higher proportion of pupils from manual social class backgrounds in their intakes, and this appeared to mask differences that exist between the two sectors. McPherson and Willms interpreted the fact that the estimate of the mean attainment of Catholic schools was substantially increased after controlling for the mean social class of their intakes as an indication that there are process within these schools that relate to their intakes, but which are not amenable to change by the schools themselves.

Two alternative interpretations are also possible. The effects associated with the mean social class of schools may reflect unmeasured selection effects not otherwise included in the model. In particular, factors such as pupil attitudes, family support, etc, might be different between the sectors, particularly since the Catholic sector has a less advantaged social class distribution. If this is the case, then it is appropriate to include the mean social class of school intakes in the model, and the increase in the estimated differential between sectors will then represent a more accurate estimate of that differential. In this case, we need to seek an explanation for the large differential[6] that McPherson and Willms found between these sectors.

The second interpretation is that the variation in attainment that is associated with the mean social class of schools is a proxy for variation in certain school processes. If all of the social class variation in intakes is a proxy for school processes then the interpretation of the McPherson and Willms finding is that there is something in the nature of school processes in Catholic schools that depresses attainment to a level below that which it would otherwise be.

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[6] Interpreted this way the differential is estimated to be between 1 and 3 O-grade passes. Source: table 3, McPherson and Willms(1986).

The findings from the analyses presented in this chapter indicate that there is an advantage associated with the Catholic sector, but that this advantage is relatively small once school process factors† are taken into account, and that it exists for the overall SCE attainment measure, and for fourth year English attainment, but not for fourth year arithmetic attainment. The estimates of mean attainment before any adjustment for pupil background characteristics are lower in the Catholic sector than in the non-denominational sector. Once adjusted for the background characteristics of pupils this position changes, with no sector effects being found for overall SCE attainment, or for fourth year arithmetic, but there is an advantage in favour of the Catholic sector of 12 percent of a standard deviation in fourth year English. If the mean social class of schools is then taken into account a sector effect is found for all three outcomes, with the advantage being in favour of the Catholic sector. Mean attainment in the Catholic sector is estimated to be 11 percent of a standard deviation higher for overall SCE attainment, 8 percent for English, and 19 percent for arithmetic, than in the non-denominational sector. These are substantial advantages which are of the order of one Ordinary grade pass on the overall SCE outcome. The significant increase in the estimates for the Catholic sector after taking account of the mean social class of school intakes is is due to the high proportion of Catholic schools that serve disadvantaged and deprived areas of the population.

At this juncture the interpretation of the adjustment for the mean social class of schools is critical to the interpretation of what this Catholic sector effect means. If the adjustment controls for differences in pupil characteristics between schools that is otherwise not controlled for in the model, then the conclusion to be drawn is that the estimated sector effect reflects a real advantage in favour of Catholic schools. However, if any of the variation that is controlled through the introduction of the mean social class of schools is associated with school processes, or any more general social-psychological processes

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† The reader is reminded that the measures of school process employed in this study are based on pupil reports of teacher and pupil behaviours.

that affect pupil interaction and attainment within Catholic schools, then the interpretation to be made is that these processes are having a negative effect on pupil attainment in Catholic schools.

The addition of school process constructs to the model reduces the sector effect by about half. The Catholic schools were found to have more favourable school process environments, hence the reduction in the sector effect after controlling for this advantage. The sector differential is reduced to 5 percent of a standard deviation in overall SCE attainment, 13 percent in fourth year English, and 3 percent in fourth year arithmetic attainment.

The school process constructs that were responsible for explaining this portion of the sector differential consisted of three instructionally related measures and three measures of the influence of significant others. The instructionally related constructs were, *teaching methods, good teacher, truant S2-S4*, while the significant others constructs were, *teacher support for staying on, parental support for staying on*, and *peers took school seriously*.† These constructs explained between 63-65 percent of the sector differential in overall SCE attainment, and in fourth year arithmetic, but only 28 percent in fourth year English attainment. These estimates of the influence of school process are based on the reduction in the sector differential associated with their introduction into a model that included the mean social class of schools, in addition to pupil-level background measures. That is, these effects are additional to any aspects of the influence of school process that may be controlled for by the mean social class measure. This model including school process is relatively successful in explaining the variation in mean attainment between schools. It explains 70 percent of the variation in mean SCE attainment, 43 percent of the variation in fourth year English attainment, and 55 percent of the variation in fourth year arithmetic attainment

† The interpretation of these measures as indicators of school process is dependant on the validity of the pupil reports of school behaviours.

Although the forgoing has indicated that these factors explain sector differentials in the estimates of quality, the analyses produced little evidence that they explain sector differentials in equity. The only significant sector effect on slopes was for the measure of sibship size. The Catholic sector was found to have less of an equity differential between pupils from small and large families. There is also a difference in the social class equity differential between formally selective and non-selective schools. The equity differential was found to be lower in the selective schools for attainment on the two fourth year outcomes, but not for overall SCE attainment.

Finally, the controls for the formal and informal selectivity of schools appeared to be successful in adjusting for certain selection effects in the model. The selective schools in the system are thought to attract a relatively more able pupil population, given their social background characteristics. Hence, some form of control for this selection is required. Two approaches were employed. The first was to formally model this aspect of the variation in the system, through the specification of indicators of formal and informal selection in the model. The second approach employed was to stratify the sample by subsampling schools that were subject to different degrees of selectivity. The sector estimates from the models based on these two approaches were almost identical. The method that formally models the selectivity in the system is to be preferred because it provides a richer description of the relationships among sector and selectivity effects. In addition, this method employs the full sample of all 470 schools for estimation purposes, whereas the stratification methods require the deletion of significant numbers of schools. The advantage of basing the analysis on all schools is that it provides a more powerful, in a statistical sense, hypothesis testing and modelling environment.

In conclusion, the finding that attainment in the Catholic sector is on a par or higher than that in the non-denominational sector is evidence that the long struggle to provide schooling for

the Catholic population that is as effective as that in the non-denominational schools has finally achieved its aim. This conclusion is independent of whether the social class characteristics of school intakes are viewed as measures of differences in the pupils entering schools, as surrogate measures of school process, or of social environments that subsequently develop within schools. The findings from this study suggest that they are probably more validly thought of as measures of differences in the characteristics of pupils that are otherwise not controlled by the pupil-level background measures in the model. However, if they are correlated with aspects of school environments, then Catholic schools could improve their performance still further by ameliorating the negative effects of these environments, which are more prevalent in Catholic schools because they are more likely to serve areas that are socially deprived. Catholic sector schools were found to have more effective instructional environments than non-denominational schools, and these differences explained a significant proportion of the differential between the two sectors.

Chapter 11

The Effects of Institutional Differentiation in a School System: the Legacy of Victorian and Post-Victorian Educational Developments

School effects and their relationship to historical features of the system

McPherson and Willms argued that the Scottish "state school system at the end of the 1970s incorporated three distinct phases of historical development, or sedimentation" (1986, pp240). The account of the historical development of the secondary school system in chapter 4 indicated that the types of schools that were founded in each of the main phases of development differed. Those founded in the period before the state formally became involved in secondary education were mainly Grammar schools and Academies which provided an education from the elementary years through to secondary schooling, that lead to the professions and higher education in the universities. Although the parochial school system provided an alternative route through to higher education, by the mid nineteenth century this route was used by relatively few pupils entered higher education (Anderson, 1983). There were 66 schools of this vintage still surviving within the national system, or as independent schools, in the late 1970s. These will be referred to as the Victorian schools as most of them were established during the nineteenth century, although a few can be traced back beyond that time.[1] The first tranche of state schools developed to provide education of a secondary nature were the Higher Grade schools established during the first two decades of this century.[2] These will be referred to as the post-Victorian secondary schools.

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[1] The institutional history of the oldest surviving school in the system can be traced back to the twelfth century (Kerr, 1913).

[2] These schools had almost all provided supplementary courses which were of a 'post-elementary' character in their former status as elementary schools.

Together with the Victorian schools they were to comprise the majority of the senior secondary schools that existed from the 1920s through until the comprehensive reforms of the 1960s. The reorganisation of schools required to implement these reforms lead to the retention of almost all the then senior secondary schools, but many of the junior secondary schools were combined to create new comprehensives. The schools that were not to gain full secondary status until after the comprehensive reforms of the 1960s will be referred to as the modern school sector.[3]

The aims of this chapter

In an earlier study of Scottish schools Gray *et al* concluded that "[I]t seems that the previous organisation of a school and, more important, the meaning of its organisational history in the context of the educational policy of the local authority, may continue to influence the performance of the school over and above the factors associated with the characteristics of its intake" (1983, p291). McPherson and Willms(1986) studied the effectiveness of the above three sets of schools and found that the group that were founded in Victorian times were more effective in the late 1970s than those established by the post-Victorian or the modern reforms. However, their study crossed this dimension of schools with another describing the denominational status of the schools. This chapter focuses on the historical dimension of that typology. The surviving schools in the mid-seventies that were founded during each of these three phases of development will be referred to as the Victorian, post-Victorian, and modern sectors, respectively.

The analyses presented below first describe the variation in the socioeconomic composition and pupil attainment of schools in each of the three sectors. The second phase of the analysis assesses the evidence for differentials in the effectiveness of schools in the

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[3] McPherson and Willms (1986) refer to this group of schools as the *post-1965* schools.

three sectors. The third phase of the analysis will then model the variation in quality and equity differentials as functions of the intake compositional characteristics of schools, and of school process characteristics.

Analyses

Variation in pupil background and attainment within sectors

Figure 11.1 shows that most of the pupils in the mid-seventies were in schools that had been established in modern times. Almost sixty percent of pupils were in schools that had been established after the 1918 Act. Many of these schools were reorganised and combined with others in the comprehensive reforms of the sixties and early seventies. Only sixteen percent of schools have a lineage that goes back into the Victorian era, and about thirty percent were established in the post-Victorian developments of the first two decades of this century.

Figure 11.2 shows that in the mid-seventies there was an ordered relationship between social class and the intakes to schools in the three sectors. The Victorian schools having a more advantaged social class profile than schools established in the post-Victorian era, which in turn had a more favourable social class profile than the schools that have been established in modern times. Forty-two percent of the pupils in the Victorian schools were from non-manual backgrounds, while 33 percent of pupils in the post-Victorian schools, and 28 percent in the modern schools were from non-manual backgrounds.

The differences between these three sectors are also reflected in the similarly ordered pattern of differences in the distribution of pupil attainment between them (figure 11.3). In fact the percentages of pupils gaining one or more Highers qualification is almost an exact parallel to the percentages of non-manual pupils in each sector: 43 percent of pupils in the Victorian schools, 34 percent in post-Victorian schools, and 28 percent in the modern schools gained one or more Highers. *t*

text recommences, after figures, on page 351

Figure 11.1 Distribution of pupils by era in which schools founded

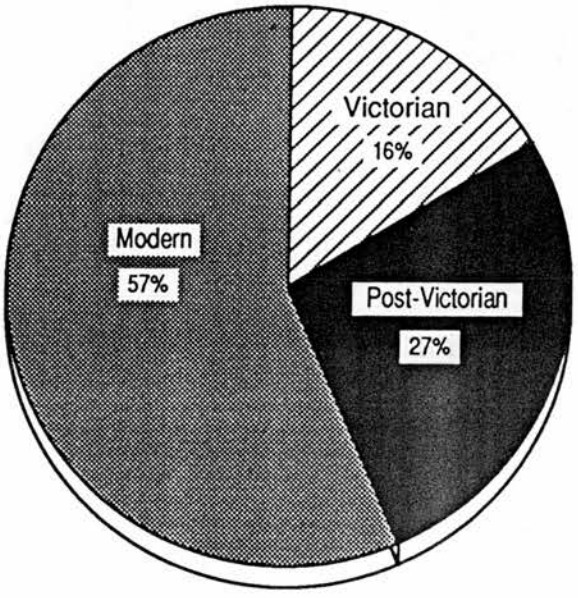


Figure 11.2 Distribution of social class within sectors

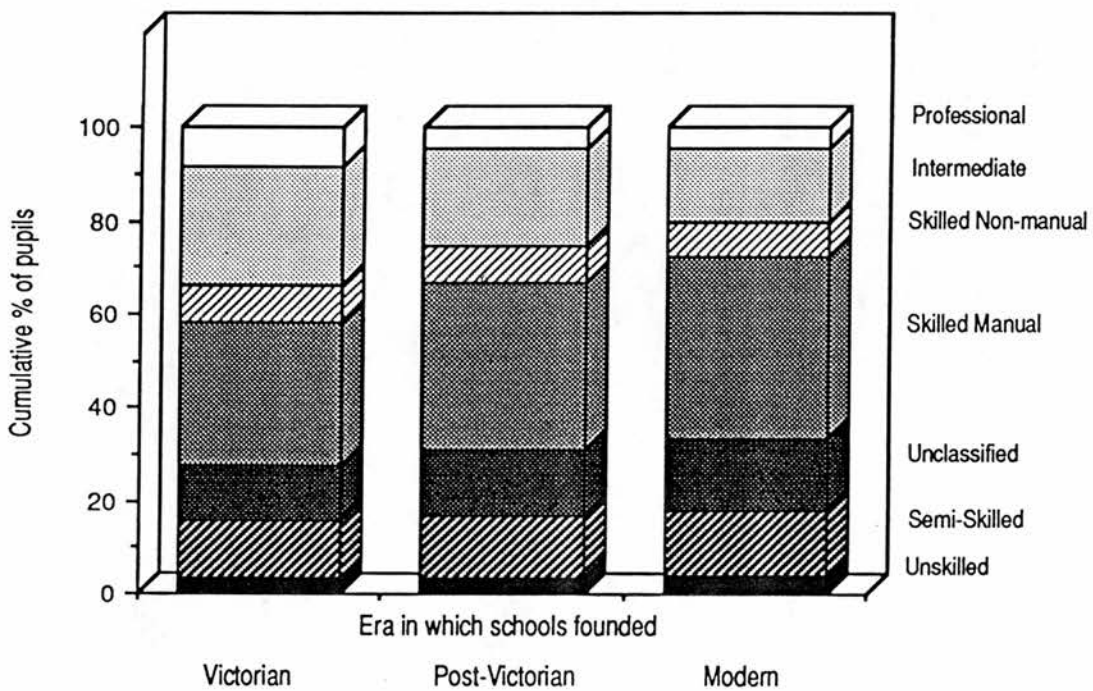


Figure 11.3 Distribution of attainment within sectors

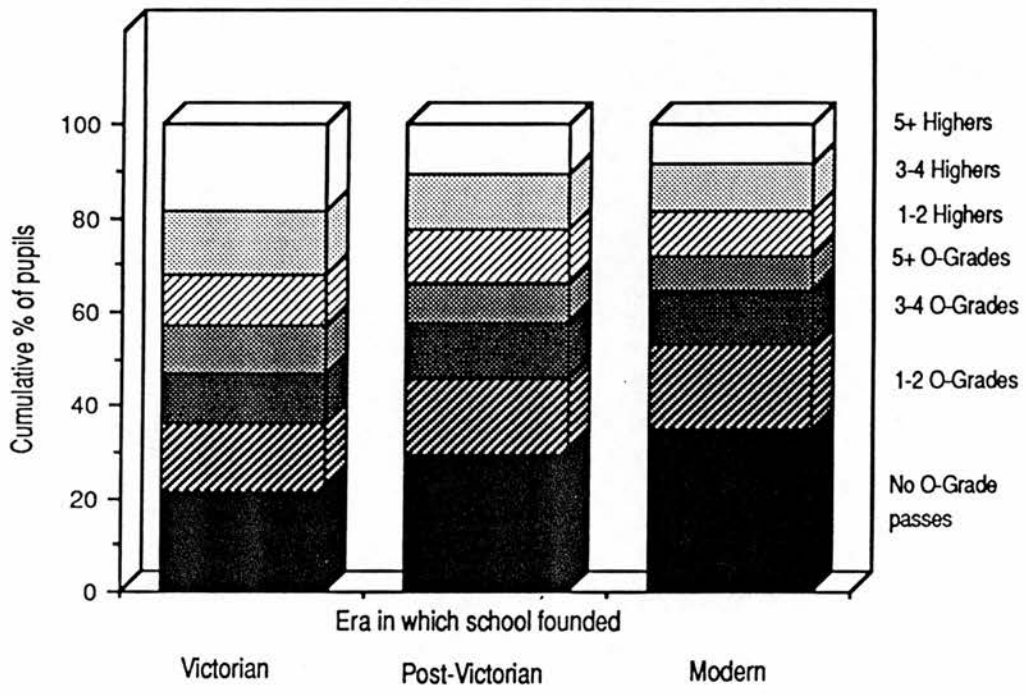
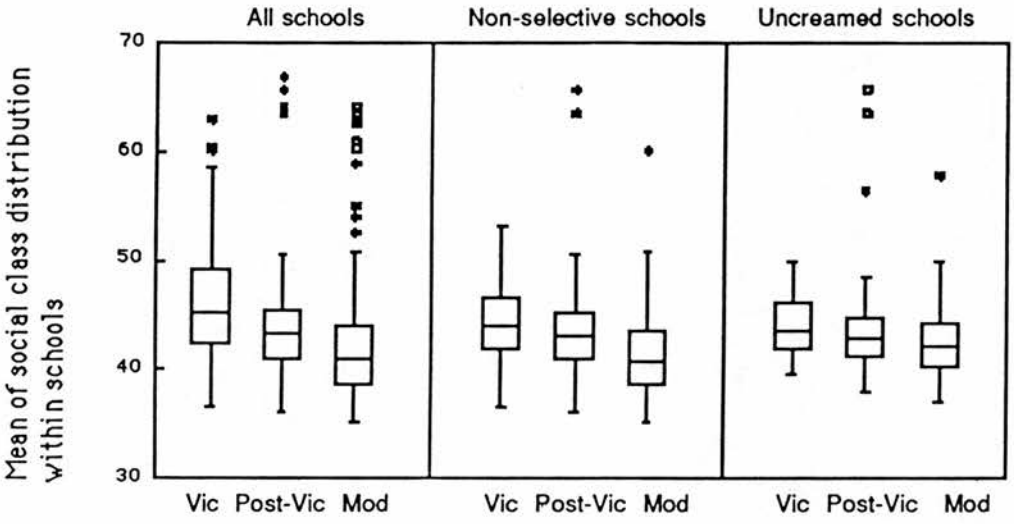


Figure 11.4a Characteristics of school intakes: mean & standard deviation



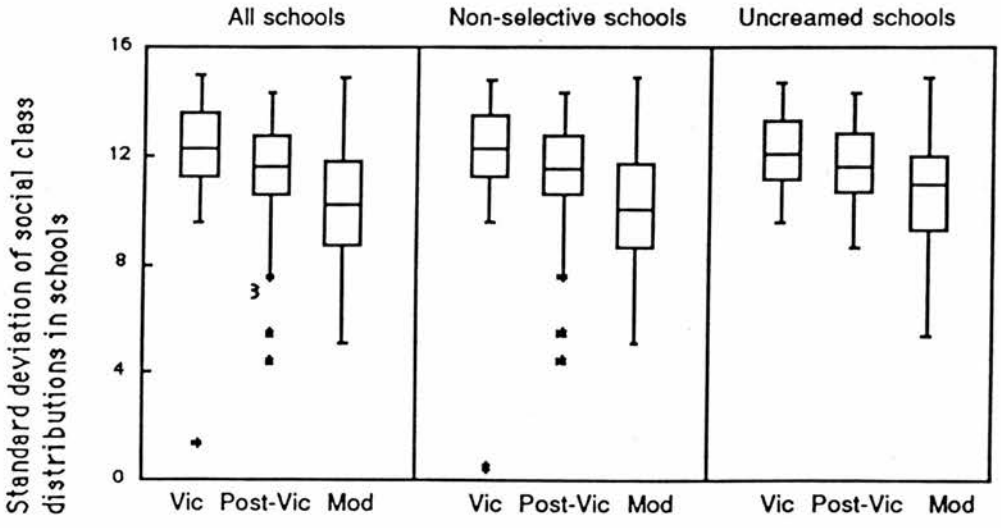
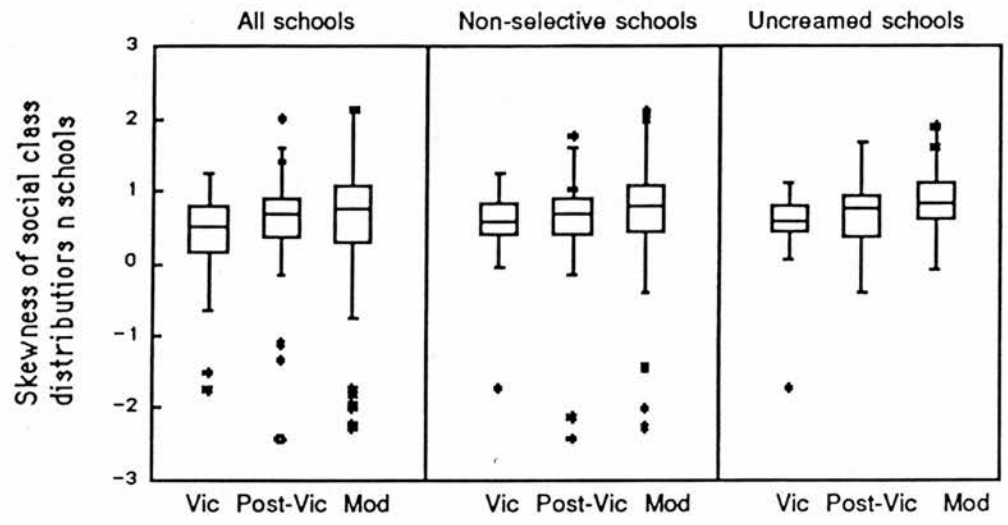


Figure 11.4b Characteristics of school intakes: skewness and kurtosis of the distribution



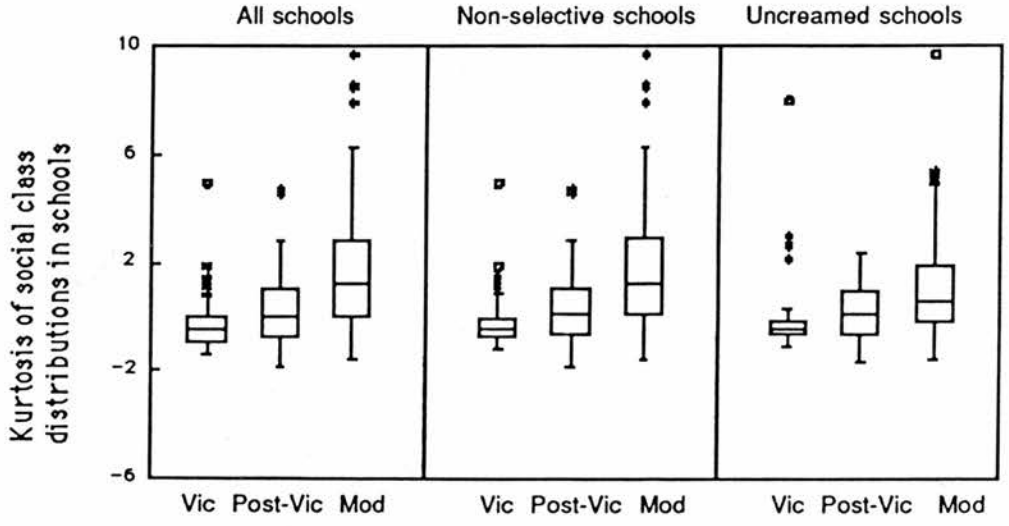


Figure 11.5a Variation in unadjusted outcomes by era in which school founded: overall SCE attainment

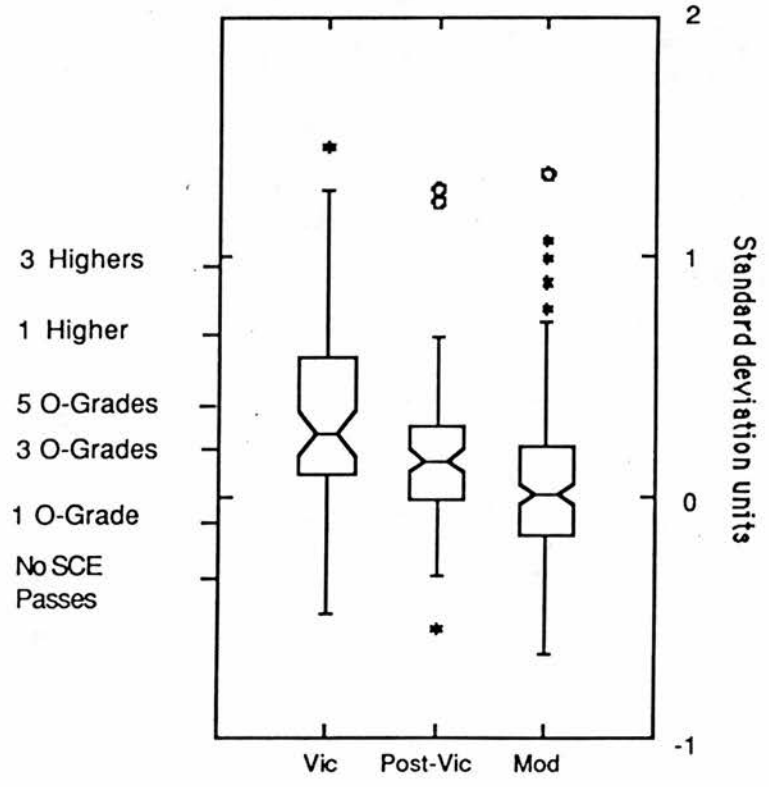


Figure 11.5b Variation in unadjusted outcomes by era in which school founded: fourth year English attainment

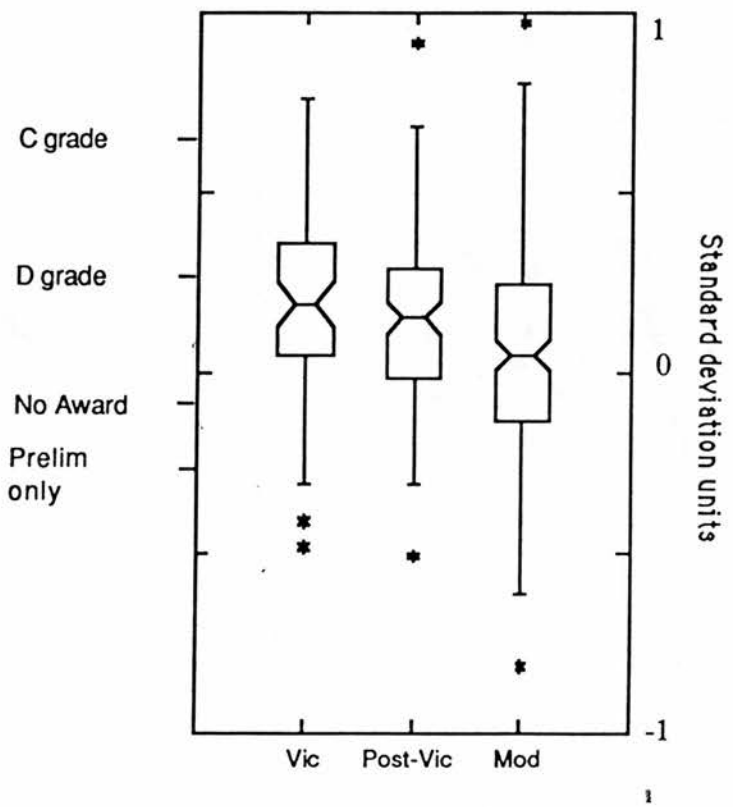


Figure 11.5c Variation in unadjusted outcomes by era in which school founded: fourth year arithmetic attainment

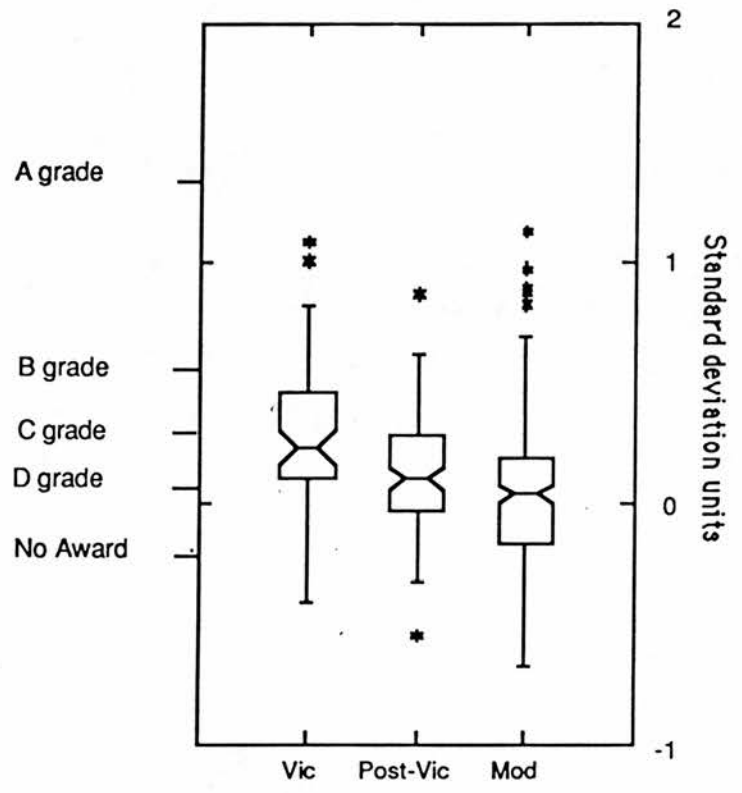


Figure 11.6a Distribution of school process constructs by sector: Instructional factors

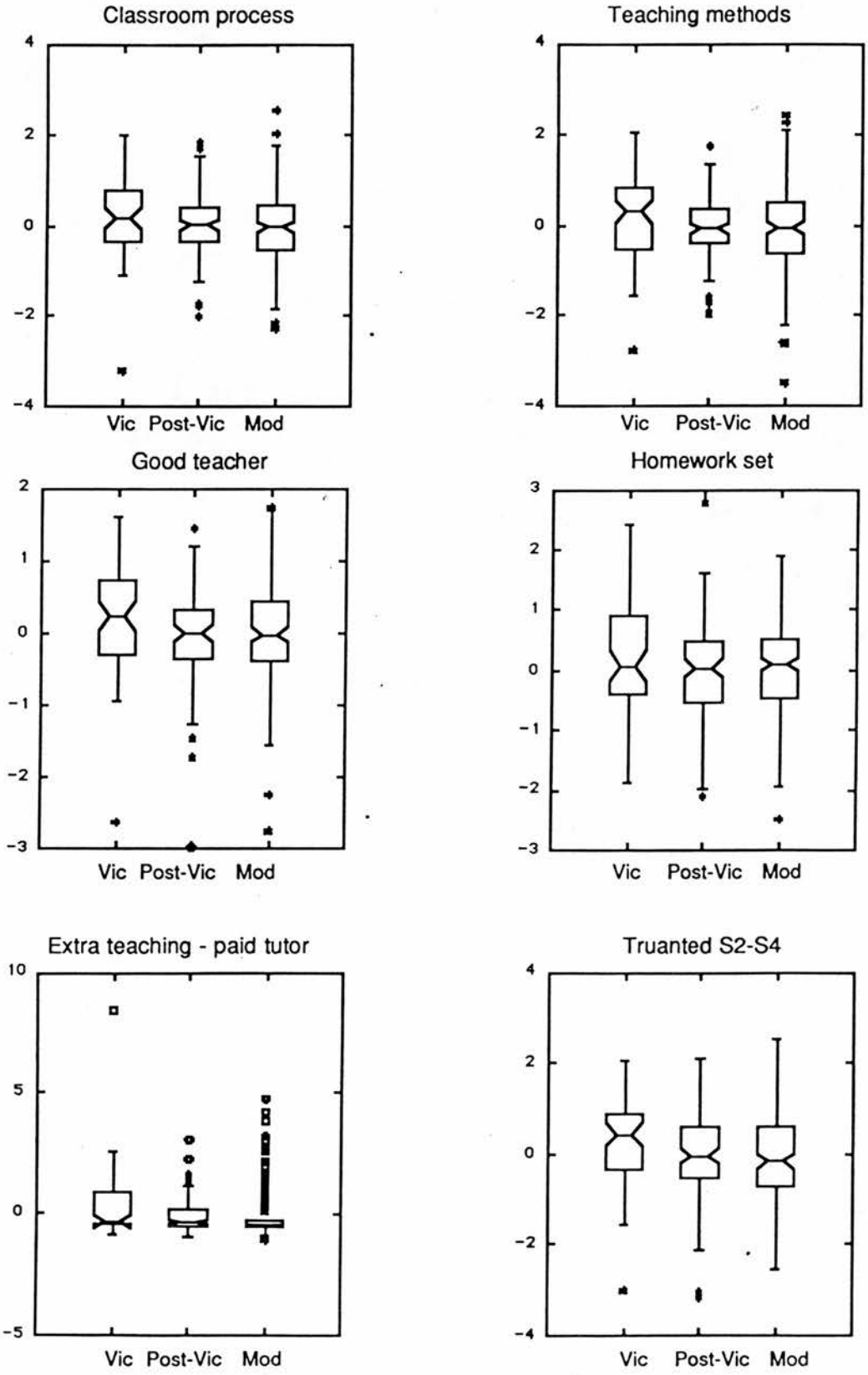
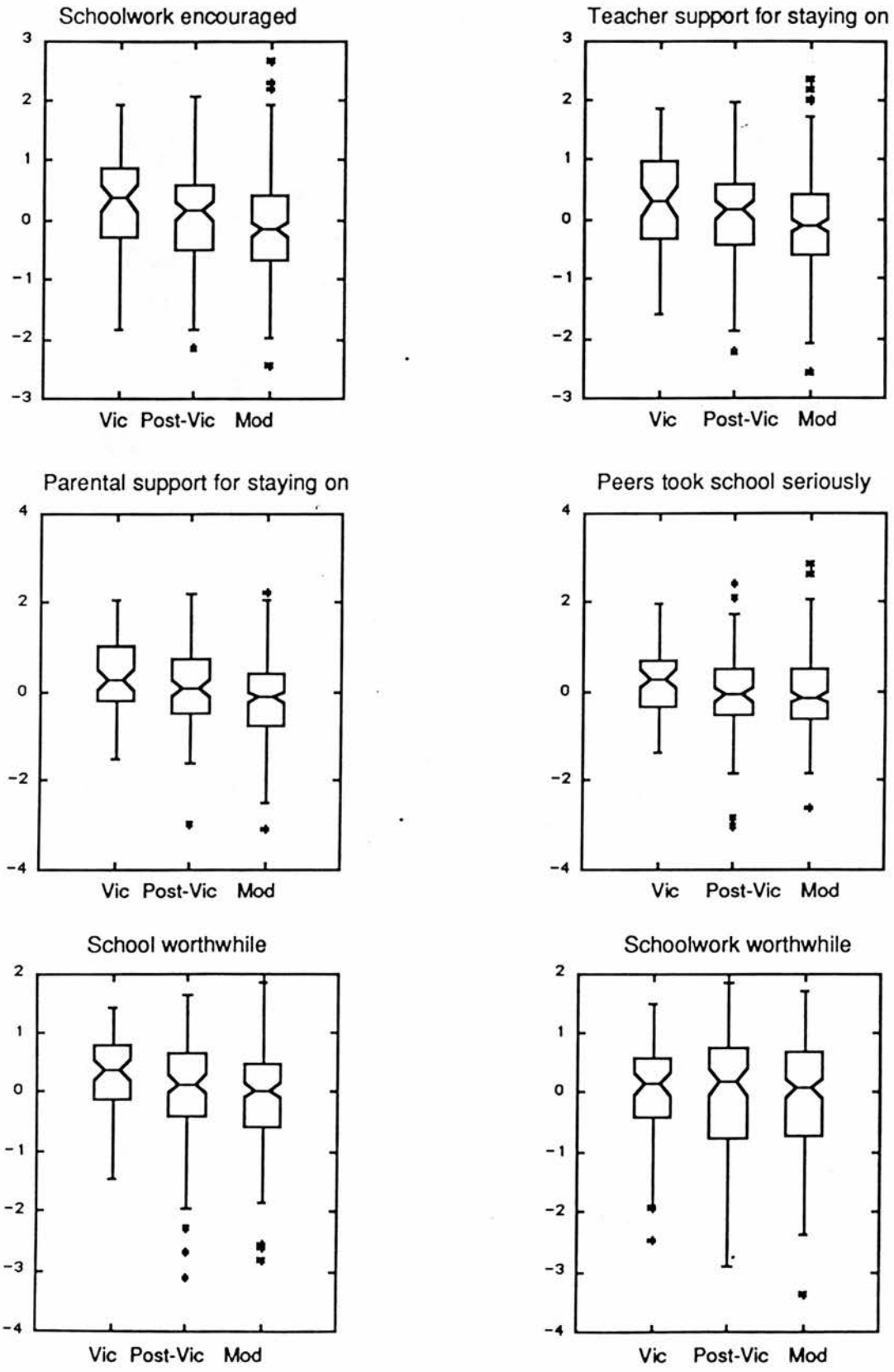


Figure 11.6b Distributions of school process constructs by sector: Influence of significant others & social outcomes



The above statistics provide an overview of the sectors as a whole. However, there were also marked differences in the social class distribution of school intakes within sectors. Figures 11.4a and 11.4b show the distribution of the average social class of schools along with three indicators of the dispersion about the mean for each school. The set of three boxplots in the left panel of each figure refers to all schools in the system and it shows that the dispersion in the distribution of mean social class was greater in the Victorian school sector than in the other two sectors. That is, there was greater social class differentiation between schools in this sector than in the other two sectors.

The post-Victorian sector has the least variation in the mean social class of schools, with the exception of a small number of very high average social class schools. The modern school sector has somewhat wider variation in the mean social class of schools than the post-Victorian sector, with more high, although fewer very high, social class schools. The lower left panel in figure 11.4a indicates that the variation of social class within schools is greater in the Victorian and post-Victorian sectors than in the modern school sector. The median standard deviation of intakes in the Victorian sector is slightly above 12, while it is lower in the other two sectors: about 11.5 in the post-Victorian sector, and 10 in the modern sector. This means that the older schools have more heterogeneous intakes than the schools in the modern sector. However, there is less variation across schools in the median level of heterogeneity within schools in the Victorian sector. Thus, the Victorian schools tend to have a wider dispersion of social class within schools than the other two sectors, but to also be more uniform across schools in terms of this characteristic of their intake composition. The left panels of figure 11.4b show the skewness and kurtosis of the distribution of social class within schools. There is an ordered relationship between sectors and the characteristics of the variation in the intakes to schools. Modern schools have a wider range of skewness in their intakes and a higher median level of skewness than schools in the other two sectors. The

post-Victorian schools have the narrowest range of skewness if the few extreme schools are discounted, but the median level of skewness in this sector is higher than in the Victorian sector. The kurtosis plots indicate the degree to which the school distributions are peaked, that is, the extent of homogeneity about the mean within the school. Again, the notable feature of the plots in figure 11.4b is the much greater variation among schools in the modern sector in comparison with the other two sectors. All three sectors have a median level of kurtosis less than two[4] but a significant proportion of the schools in the modern sector have social class intakes that are more peaked than this. The social class distribution of school intakes in the Victorian sector are much less peaked than the normal distribution.

Overall the profiles of school intakes in the three sectors can be summed up in the following way. The intakes for Victorian schools are more advantaged than those in the post-Victorian sector, which in turn, are more advantaged than schools in the modern sector. The overall dispersion of the mean social class of schools is more evenly distributed over a wider range in the Victorian sector, and more concentrated in the other two sectors, with a small number of schools being exceptions in the post-Victorian and modern sectors. The dispersion of pupils about the school mean is generally greater in the Victorian sector, a feature which is consistent across schools in the sector. The schools in the modern sector have the narrowest range of social class in their intakes, and they are also likely to have a highly skewed distribution of pupils about this centre of gravity. The Victorian schools are characterised by intakes that are more highly differentiated between schools, with a high degree of within-school dispersion that is evenly spread. Modern schools are characterised by much less differentiation between schools, and relatively less variation

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[4] The normal distribution has a kurtosis value of **3**.

within schools, but there is also less evenness in the spread of pupils in these schools.

The middle and rightmost panels in figures 11.4a and 11.4b are for nested subgroups of the schools in the system. The middle panel is based on all schools that were non-selective.[5] In effect, this division of schools demarcates the government supported and administered schools in the system from those which were Grant-Aided or Independent. The rightmost panel is based on the subset of non-selective schools that were not subject to creaming by selective schools in the system. The number of schools in the non-selective subsample is 397, and the number in the uncreamed subsample is 165. The pattern of relationships between sector and the characteristics of school intake distributions is generally similar to the profile above for all schools in the system for these two subsets of schools. There is, however, a reduction in the variation in the plots for the Victorian schools in comparison to their profile in the full sample. This generally makes them much more like the post-Victorian school sector in these two panels, although the ordering between sectors remains the same. Compared with the range of dispersion between schools in the system, the three sectors look remarkably alike in terms of the mean social class of their intakes when the sample is restricted to uncreamed non-selective schools only. However, significant differences remain between the sectors with respect to the degree of within-school dispersion about these means.

Estimates of differentials in attainment between sectors

Figures 11.5a-c display plots of the unadjusted means for attainment on the three outcomes. The Victorian sector has a higher median than the post-Victorian sector, which in turn has a higher

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[5] The schools in the feeder receiver subsystems described in chapters 4 and 9 are included in the non-selective subsample of schools.

median than the modern sector. The notches in the boxplots overlap between sectors in some cases indicating that for some comparisons these differences in attainment between sectors are not statistically significant. The post-Victorian sector has less overall variation among its schools than that for the other two sectors. The difference in the medians for the overall measure of SCE attainment is of the order of an Ordinary grade pass between the Victorian and post-Victorian sectors, and there is a difference of about this much again between the post-Victorian and modern sectors. No account is taken of the differences in the degree of selectivity of the sectors in this initial comparison and it is possible that selection effects explain these differentials.

Differences in school process between sectors

The variation among sectors in most of the school process constructs displayed in figures 11.6a and 11.6b is relatively small compared to the variation within sectors. There is little difference between the post-Victorian and the modern schools in their median levels for the six instructionally related constructs, although the within-sector variation is generally greater for the modern sectors. The Victorian sector has marginally higher median levels on all six constructs than the other two sectors, although in most cases the difference does not appear to be statistically significant. However, the construct measuring the extent of pupils receiving additional teaching from a paid tutor is an exception to this pattern. Although schools in all three sectors contain some variation on this construct the modern sector contains a small number of schools that markedly depart from the norm for that sector. In general, this sector has the least variation, most schools recording zero or a very low score on this construct.

The construct indicating the incidence of truancy[6] varies only between the Victorian school sector and the other two, which are almost equal in terms of the median scores on this construct. The modern school sector, however, has a wide range of scores on this construct, recording both the highest and lowest scores.

Of the six constructs shown in figure 11.6b, the four that relate to the influence of significant others show the most consistent pattern across sectors. On all four of these constructs the Victorian school sector scores more highly than the post-Victorian school sector, which in turn scores higher than the modern school sector. The range of variation within sectors is similar for the two constructs relating to teacher encouragement and support, and for peers taking their schooling seriously, but there is more variation within the modern sector for the constructs relating to parental support for staying on after fourth year.

Pupil social evaluations of their schooling do not differ markedly from sector to sector, although the Victorian sector has a higher median than the other two sectors on one of the constructs. The post-Victorian sector has considerably greater variation about the sector median than that found in the other two sectors, on both constructs

Estimates of sector differentials after adjustment for pupil background

The above descriptive analysis of the variation between sectors has focussed on the full sample of all 470 schools. The earlier analyses (chapter 9), however, found that pupil attainment varies with the degree of selectivity of subgroups of schools in the system. Schools can be identified as formally selective or as subject to the influences of others that are selective. The intakes to the formally selective schools are expected to vary from those entering other

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[6] Positively coded, so that a high score represents a low rate of truancy.

schools even after controlling for the measures of pupil background available in this study. In particular, selective schools are likely to recruit pupils who may be academically more able or who come from advantaged homes that confer additional benefits upon their education progress at secondary school. This section estimates the mean level of pupil attainment in each sector after taking account of selectivity by controlling for whether schools are formally selective or informally subject to selection through the possible creaming-off of their more advantaged pupils by nearby selective schools.

The methodology employed is an incremental one in which an initially naive model of sector variation is made increasingly more complex through the introduction of controls for the types of pupils attending schools in each sector. The first model estimates the variation between sectors before any between-school adjustments for pupil background characteristics. The *within-school model* can be specified as:

$$y_{ij} = \alpha_{j0} + \alpha_{j1}(X_{ij1} - x_{j1}) + \ldots\ldots + \alpha_{j4}(X_{ij4} - x_{j4}) + \varepsilon_{ij} \qquad 11.1^{7}$$

and the *between-school* model is:

$$\alpha_{j0} = \delta_0 + \mu_{0j} \qquad 11.2$$

$$\alpha_{jk} = \delta_k + \mu_{jk} \qquad 11.3$$

where, equation 11.3 is repeated for each of the k = 1, 2, 3, 4, slope parameters in 11.1. This is simply a pooled within-schools model that treats school intercepts and slopes as random effects. The estimates from this model provide a base against which to gauge success in explaining between school variation through the inclusion of sector and school process factors in later analyses.

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7 As in the previous chapter, lower case x_{jk} represents the within school mean for upper case X_{ijk}.

A second model is specified by the expansion of the above to provide explicit representation for sector indicator variables. The within-school model remains the same as in 11.1, but the *between-school* model becomes:

$$\alpha_{j0} = \delta_0 + \gamma_{10}S_{1j} + \gamma_{20}S_{2j} + \mu_{j0} \qquad 11.4$$

$$\alpha_{jk} = \delta_k + \gamma_{1k}S_{1j} + \gamma_{2k}S_{2j} + \mu_{jk} \qquad 11.5$$

$$k = 1, ..,4$$

where, the only change to 11.2 and 11.3 is the the addition of the sector indicator variables S_1 and S_2. It is necessary to specify *n-1* such indicator variables to represent the differences between *n* sectors. The specification of the model in this way, that is, with the inclusion of pupil background characteristics in the within-school part of the model, provides a model based approach to the testing of contrasts between sectors. The contrasts between sectors are specified by selecting one sector as the contrast and then estimating the mean difference between this reference sector and each of the other two sectors. For the present case the three contrasts of relevance are: Victorian v's post-Victorian, Victorian v's modern, and post-Victorian v's modern. The above model specification tests only two of these three contrasts, since it contains only the one sector indicator. However, the coefficients for the indicator variable S_p and its associated standard errors provide the basis for a sequential set of hypothesis tests of the contrasts between sectors. The coefficient δ_{j0} in 11.4 does not test a contrast. It merely tests whether the intercept in the equation is non-zero, a hypothesis that is of no relevance in the present case.

The third model specified adjusts the estimates of mean attainment in each sector for differences in pupil social background. This requires a respecification of the model so that the *within-school* part of the model becomes:

$$y_{ij} = \beta_{j0} + \beta_{j1}X_{ij1} + \ldots + \beta_{j4}X_{ij4} + \varepsilon_{ij} \qquad 11.6$$

and the *between-school* model is:

$$\beta_{j0} = \delta_0 + \gamma_{10}S_{1j} + \gamma_{20}S_{2j} + \mu_{j0} \qquad 11.7$$

$$\beta_{jk} = \delta_k + \gamma_{1k}S_{1j} + \gamma_{2k}S_{2j} + \mu_{jk} \qquad k = 1, ..,4 \qquad 11.8$$

Equation 11.8 is repeated for each k = 1, 2, 3, 4 slope parameters in the within-school model. This model will be referred to as the base model.

In order to test the contrasts between sectors, the model in 11.6-11.8 for the adjusted estimates and its corollary for the unadjusted estimates defined in 11.1-11.3 above was estimated separately for each contrast sector. The estimates are reported in table 11.1, along with their standard errors. For the unadjusted estimates, all pairwise contrasts between the Victorian and post-Victorian sector are statistically significant at $p < .05$, although that for English is not statistically significant at $p < .01$. The contrasts between the Victorian and modern sectors are also all statistically significant for the unadjusted estimates at $p < .05$. The contrasts between the post-Victorian and modern sectors are statistically significant at $p < .05$ for fourth year English, but not for fourth year arithmetic, nor for overall SCE attainment. Thus, there is good evidence that the unadjusted means differ between the Victorian sector and each of the other sectors, but the evidence for concluding that the post-Victorian sector generally has a higher mean than the modern sector is weaker.

The contrast tests for the adjusted means are reported in table 11.1, also. The results for the adjusted model indicate that most of the contrasts reveal differences in mean attainment among the three sectors. Indeed, all contrasts but two are statistically significant. The two that are not statistically significant are those for English between the Victorian and the post-Victorian sectors, and for arithmetic between the post-Victorian and modern sectors.

text recommences, after tables and figures, on page 366

Table 11.1 Hypothesis tests for contrasts of differences in mean attainment between sectors

	Unadjusted means						Adjusted means					
Contrast Sector	Sector						Sector					
	Victorian			Modern			Victorian			Modern		
	est	g†	s.e	prob	est	g†	s.e	prob	est	g†	s.e	prob	est	g†	s.e	prob
Overall SCE attainment																
Post-Victorian	.31	.07	.00		-.08	.05	.08		.13	.04	.00		-.08	.03	.00	
Modern	.39	.06	.00						.21	.03	.00					
English attainment																
Post-Victorian	.14	.06	.02		-.10	.04	.01		.02	.04	.56		-.08	.03	.01	
Modern	.24	.05	.00						.10	.04	.01		-.08			
Arithmetic attainment																
Post-Victorian	.27	.06	.00		-.07	.04	.07		.13	.04	.00		-.05	.03	.08	
Modern	.35	.05	.00						.17	.03	.00					

† The values in the columns indicate the estimate of the mean for each sector relative to that for the sector designated by the contrast in the lefthand column stub.

Table 11.2 Parameter estimates for the base model

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.160	.022	.156	.023	.128	.022
Social class slope	.032	.002	.028	.001	.026	.001
Mothers education slope	.331	.018	.228	.018	.275	.018
Siblings slope	-.112	.009	-.115	.010	-.117	.010
Gender slope	.043†	.029	.311	.030	-.077	.031
Fixed sector effects for Victorian schools						
Mean attainment	.131	.037	.023†	.039	.126	.036
Social class slope	.000†	.002	-.005	.002	.000†	.002
Mothers education slope	-	-	-	-	-	-
Siblings slope	-.002†	.016	-.002†	.017	-.004†	.017
Gender slope	.058†	.048	.096†	.050	.012†	.051
Fixed sector effects for Modern schools						
Mean attainment	-.077	.026	-.077	.029	-.046†	.026
Social class slope	-.005	.002	-.005	.002	-.002†	.002
Mothers education slope	-	-	-	-	-	-
Siblings slope	.019†	.011	.018†	.012	.024	.012
Gender slope	-.000†	.036	-.030†	.037	.031†	.038

Random Effects	Variance	χ^2	df	Variance	χ^2	df	Variance	χ^2	df
Residual variation among school									
Means	.035	943	391	.041	925	391	.030	883	391
Social class slopes	.00004	507	391	.00005	489	391	.00003	465	391
Mothers education slopes	.019†	434	393	.011†	384	393	.011†	402	393
Siblings slopes	.002†	430	391	.002†	430	391	.002†	436	391
Gender slopes	.022	533	391	.020	497	391	.026	539	391

† coefficient not statistically significant at the .05 level.

Table 11.3 Parameter estimates for the base model + selection

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.513	.046	.311	.015	.347	.048
Social class slope	.028	.003	.017	.003	.019	.003
Mothers education slope	.326	.016	.291	.017	.269	.017
Siblings slope	-.100	.004	-.104	.005	-.101	.005
Gender slope	.045†	.029	.313	.030	-.074	.031
Fixed sector effects for Victorian schools						
Mean attainment	.092	.036	.009†	.040	.102	.036
Social class slope	.001†	.002	-.004†	.002	.001†	.002
Gender slope	.058†	.048	.092†	.050	.010†	.051
Fixed sector effects for Modern schools						
Mean attainment	-.098	.026	-.075	.029	-.056	.026
Social class slope	-.006	.002	-.004	.002	-.002†	.002
Gender slope	-.005†	.035	-.032†	.037	.029†	.038
Fixed sector effects for non-selective schools						
Mean attainment	-.390	.043	-.185	.048	-.243	.045
Social class slope	-.004†	.002	.010	.003	.007	.002
Fixed sector effects for uncreamed schools						
Mean attainment	.060	.024	.057	.027	.046†	.024
Social class slope	.002†	.002	.001†	.002	.001†	.001
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school Means	.031	1227 412	.042	1207 412	.029	1134 412

† coefficient not statistically significant at the .05 level.

Table 11.4 Parameter estimates for base model: non-selective schools only

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.116	.023	.132	.025	.101	.024
Social class slope	.031	.001	.027	.002	.026	.001
Mothers education slope	.311	.018	.302	.018	.267	.019
Siblings slope	-.120	.015	-.121	.011	-.121	.011
Gender slope	.035†	.033	.279	.035	-.088	.036
Fixed sector effects for Victorian schools						
Mean attainment	.084	.036	.023†	.039	.083	.037
Social class slope	-.000†	.002	-.003†	.002	.001†	.002
Mothers education slope	-	-	-	-	-	-
Siblings slope	.001†	.017	.001†	.018	.000†	.018
Gender slope	.054†	.050	.072†	.052	.023†	.054
Fixed sector effects for Modern schools						
Mean attainment	-.086	.025	-.080	.027	-.051	.026
Social class slope	-.005	.002	-.004	.002	-.001†	.002
Mothers education slope	-	-	-	-	-	-
Siblings slope	.190†	.011	.017†	.012	.023†	.012
Gender slope	-.022†	.036	-.024†	.037	.032†	.039
Fixed sector effects for uncreamed schools:						
Mean attainment	.054	.022	.046†	.024	.046	.023
Social class slope	.002†	.001	.001†	.001	.001†	.001
Mothers education slope						
Siblings slope	.015†	.010	.008†	.011	.008†	.011
Gender slope	.030†	.032	.061†	.033	.023†	.034

† coefficient not statistically significant at the .05 level.

Table 11.5 Parameter estimates for the base model: uncreamed schools only

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.157	.023	.154	.027	.134	.026
Social class slope	.033	.002	.027	.002	.027	.002
Mothers education slope	.364	.026	.336	.026	.309	.026
Siblings slope	-.100	.013	-.103	.014	-.102	.014
Gender slope	.024	.040	.339	.042	-.072†	.045
Fixed sector effects for Victorian schools						
Mean attainment	.062†	.039	.004†	.045	.030†	.043
Social class slope	-.002†	.003	-.002†	.003	.001†	.003
Mothers education slope	-	-	-	-	-	-
Siblings slope	-.004†	.022	-.015†	.024	-.011†	.024
Gender slope	.191	.066	.148	.070	.122†	.074
Fixed sector effects for Modern schools						
Mean attainment	-.043†	.030	-.019†	.035	.002†	.033
Social class slope	-.005	.002	-.003†	.002	-.001†	.002
Mothers education slope	-	-	-	-	-	-
Siblings slope	.011†	.016	.004†	.018	.003†	.017
Gender slope	.029†	.052	-.050†	.054	.012†	.058

† coefficient not statistically significant at the .05 level.

Figure 11.7 Social class distribution among non-selective creamed and uncreamed schools

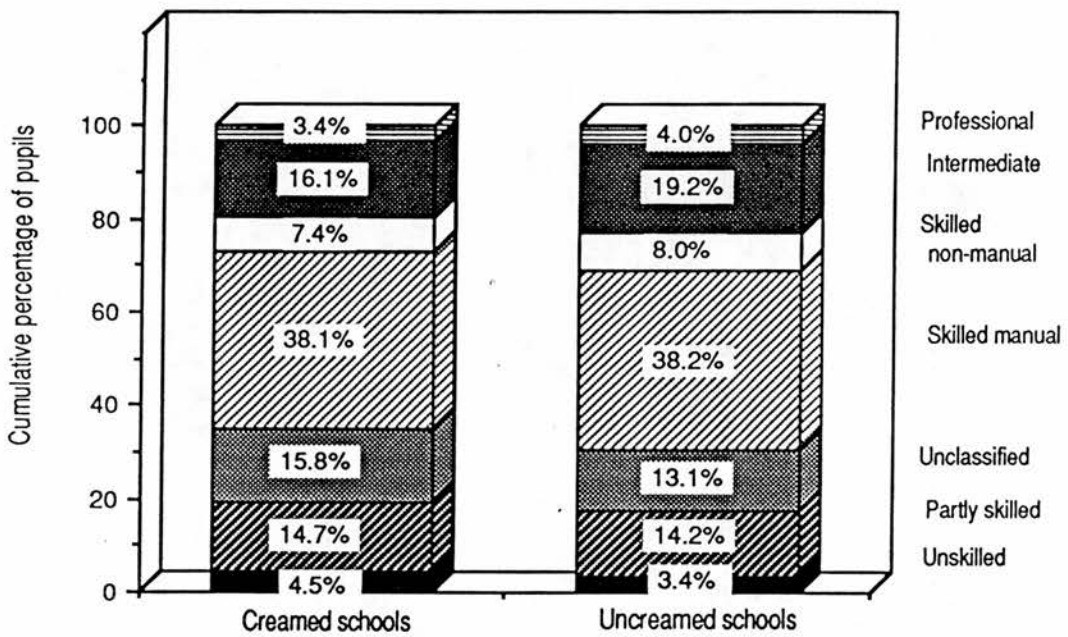
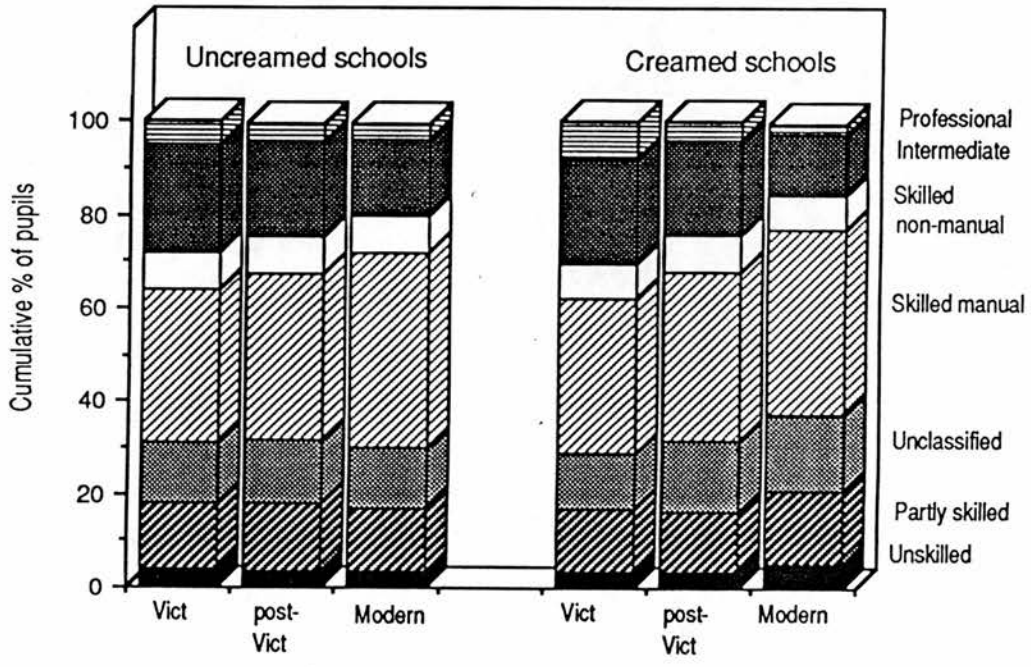


Figure 11.8 Social class distribution among non-selective creamed & uncreamed schools by sector



The parameter estimates for the base sector model (11.6-11.8) are reported in table 11.2. The information in this table that is not available from the table of contrasts, is that most of the slope differentials between sectors are statistically non-significant. The exceptions are the slopes in the modern sector for the regression of English and overall SCE attainment on social class, and for the regression of arithmetic on sibship size. The effect for the regression of English on social class is also statistically significant for the Victorian sector. These slope coefficients are all negative, indicating that the equity differentials are less in these instances than those prevailing in the Post-Victorian sector. The sibship size slope is positive, indicating that the differential in attainment between pupils from families of different size is greater for arithmetic in the modern sctor. In this model the slope for mothers education was not modelled with the sector indicators because there was no statistically significant variation between schools on any of the three outcomes for this slope. The estimated differentials in mean attainment for this model suggest that the Victorian sector has a mean that is between 2 and 13 percent of a standard deviation higher, depending on outcome, than the post-Victorian sector, while the modern sector has a mean that is between 5 and 8 percent of a standard deviation below that of the post-Victorian sector. The difference in mean attainment between the Victorian schools and the modern schools is between 10 and 21 percent of a standard deviation, in favour of the former, depending on which outcome is considered.

Thus far the model has only controlled for individual-level differences in the social background of pupils among sectors. The additional controls for the selectivity of schools that were discussed earlier are now introduced into the model. The within-school model remains as in 11.6, but the between-school model is augmented by the inclusion of two indicator variables to indicate whether schools are themselves formally selective, or whether they are potentially subject to informal processes of selection. The *between-school* model becomes:

$$\beta_{j0} = \delta_0 + \gamma_0 S_j + \theta_0 Z_j + \Phi_0 W_j + \mu_{j0} \qquad 11.9$$

$$\beta_{jk} = \delta_k + \gamma_k S_j + \theta_k Z_j + \Phi_k W_j + \mu_{jk} \qquad 11.10$$

where, Z_j is coded 0 for creamed schools and 1 otherwise; and W_j is coded 1 for formally selective schools and 0 otherwise.

Table 11.3 presents estimates for this model. The estimates of sector means in this model differ from those for the previous model that did not include controls for the selectivity of schools. The estimates for the Victorian sector are reduced by between 2 and 4 percent of a standard deviation, and those for the modern schools are increased for two of the three outcomes, albeit marginally. The decrease in the advantage held by the Victorian schools is consistent with a view that they are the more selective schools in the system, but the very small increase in the sector effect for modern schools after controlling for selectivity is not consistent with a view that their intakes are significantly creamed by selective schools. The estimates for the two selectivity indicators do, however, behave as would be expected. The indicator of formal selectivity is large and indicates that the mean level of attainment in selective schools is between 19 percent and 39 percent of a standard deviation above that in non-selective schools. However, this result cannot be interpreted as an estimate of the real differences between selective and non-selective schools after adjustment for pupil intakes, because there is no control in this model for the higher ability of the intakes to selective schools. The indicator for informal selection, or creaming, is of the expected positive sign, indicating that uncreamed schools have higher mean levels of attainment than creamed schools, but it indicates that the differential associated with creaming is only of the order of 5 percent of a standard deviation.

The estimates of sector effects on covariate slopes indicate that Victorian schools do not differ from post-Victorian schools in this respect. The slopes for the modern school sector do not vary consistently from those for the post-Victorian sector for gender and

for sibship size, but the slope for the regression of overall SCE attainment and English on social class is flatter in the modern sector than in the post-Victorian sector. Creamed schools do not have different social class slopes to their uncreamed counterparts on any of the three outcomes, nor do selective schools and non-selective schools for the overall SCE outcome. Selective schools, however, have steeper social class slopes than non-selective schools for the two fourth year outcomes of English and arithmetic. In passing, we note that there are no gender differentials between sectors, nor are there any between creamed and uncreamed non-selective schools. Further, there are no gender differentials between selective and non-selective schools on overall SCE attainment, but girls have higher mean attainment in selective schools in the two fourth year outcomes.

The estimates for the model based on the subsample of schools that are formally non-selective are presented in table 11.4. The same pattern of sector effects is observed for this more restricted subset of schools. The differences between the estimates of sector effects in these data and those for the full data set (table 11.3) are in all cases small (range .004 to .014) and are of no substantive import. Thus, excluding the formally selective schools from the sample has no direct implications for the estimates of mean attainment in the three sectors. Estimates for data that is based on a further restriction of schools to those that are not subject to informal selection, ie. the uncreamed schools, are given in table 11.5. The inference of a sector effect on mean attainment for either the Victorian or the modern schools is not upheld in this subset of the population of schools. All sector effects are smaller in this model and none of the estimates are statistically significant. The largest estimate of sector effects on mean attainemnt among these schools is .06 for the Victorian schools on the overall SCE outcome.

Thus, effects are found for both sectors in relation to those for the post-Victorian schools when the analysis is based on all schools in the system. Substantively similar estimates are also found when the data is restricted to schools that are classified as formally non-

selective. However, upon further restriction to the schools that have been classified as not subject to informal selection these sector effects become statistically non-significant, and in all cases are estimated to be 6 percent of a standard deviation, or less. This latter result indicates that either, the first two analyses are failing to control for unmeasured selection processes that affect the allocation of pupils to schools, or that the sample of schools that are classified as uncreamed is more homogeneous in other respects among sectors than the wider sample of all formally non-selective schools. The differentials between uncreamed and creamed schools in tables 11.3 and 11.4 are only of the order of 5 percent of a standard deviation, and are not always statistically significant, however, they are consistent with a view that the uncreamed schools have a marginally higher mean level of attainment, than their creamed counterparts.

Figure 11.7 shows that the aggregate social class distribution is remarkably similar in creamed and uncreamed schools. Although, there is a marginally more advantaged distribution in the uncreamed schools: 31 percent are from non-manual backgrounds, whereas 27 percent are from such backgrounds in the creamed schools. The narrower differentials in the within sector distributions shown in figure 11.8 for the uncreamed schools, however, indicates a possible source of the difference in findings for the uncreamed and full sample. There is greater similarity in the within-sector distributions for the uncreamed schools. This suggests that the differences in these findings between the full sample and the uncreamed sample may be related to the aggregate composition of the sectors. The creamed schools are predominantly city schools, and figure 9.5a and 9.5b showd this group of schools to have the most disadvantaged social class profile and the lowest attainment profile. A proportion of the city schools are in socially deprived areas, and this may also explain part of the reason for the difference in findings between the uncreamed and full non-selective sample (Garner, 1987).

Table 11.6 Parameter estimates for the base model + selection + mean social class

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.319	.046	.179	.053	.187	.048
Social class slope	.023	.003	.012	.003	.016	.002
Mothers education slope	.315	.016	.283	.017	.257	.017
Siblings slope	-.111	.008	-.042	.021	-.117	.008
Gender slope	.049	.015	.308	.017	-.058	.016
Fixed sector effects for Victorian schools						
Mean attainment	.064	.032	.000†	.037	.079	.032
Social class slope	.001†	.002				
Gender slope			.059†	.044		
Fixed sector effects for Modern schools						
Mean attainment	-.054	.024	.050†	.027	-.017†	.024
Social class slope	-.006	.002	-.003	.002	-.003	.001
Siblings slope	.022	.010			.028	.010
Fixed sector effects for non-selective schools						
Mean attainment	-.175	.045	-.018†	.050	-.058†	.045
Social class slope	.008	.002	.015	.003	.011	.002
Mothers education slope			-.064	.022		
Fixed sector effects for uncreamed schools						
Mean attainment	.029†	.021				
Social class slope	.002†	.002				
Fixed sector effects for mean social class of schools						
Mean attainment	.024	.002	.019	.003	.021	.002
Random Effects	Variance	χ^2 df		Variance	χ^2 df	
Variance	χ^2 df					
Residual variation among school Means	.021	853 403	.034	914 404	.023	829 404

† coefficient not statistically significant at the .05 level.

The effects of school composition on sector differentials

In chapter 10 it was found that the addition of a variable measuring the mean social class of schools had a significant effect on the magnitude of the sector effects relating to the denominational status of schools. As discussed in that chapter, there is a debate as to what extent the mean social class of schools proxies for unmeasured selection effects, and to what extent it is a proxy for school process factors not included in the model. School process factors will form the focus of the analyses in the next section. This section considers the effect of including the mean social class of schools in the model. The model in 11.6, 11.9 and 11.10 is augmented to allow for the inclusion of a measure of school mean social class in the between-school part of the model. The revised *between- school* model becomes:

$$\beta_{j0} = \delta_0 + \gamma_0 S_j + \theta_0 Z_j + \Phi_0 W_j + \kappa_0 x^*_j + \mu_{j0} \qquad 11.11$$

$$\beta_{jk} = \delta_k + \gamma_k S_j + \theta_k Z_j + \Phi_k W_j + \kappa_0 x^*_j + \mu_{jk} \qquad 11.12$$

where, x^*_j is a measure of the mean social class of schools. Equation 11.11 specifies that the variation in mean attainment among schools is a function of an overall mean effect(δ_0), a sector effect ($\gamma_0 S_j$), the selectivity of schools ($\theta_0 Z_j + \Phi_0 W_j$), the mean social class of schools ($\kappa_0 x^*_j$), and a random effect (μ_{j0}). Likewise, the variation in slopes between schools (the β_{jk}) is modelled as a function of the same set of influences.

The estimates for this model are presented in table 11.6. Comparing the coefficients with those in the same model but with the variable measuring school mean social class omitted (table 11.3) indicates that the sector effects are weaker in the present model. Only half of the coefficients for the mean sector effects of Victorian and modern schools are statistically significant, and in most cases the magnitude of the effect is reduced by about a third.

The largest effect is now 8 percent of a standard deviation, for Victorian schools on the arithmetic outcome.

The effects associated with both the formal and informal selectivity of schools are also substantially reduced in this model. The coefficients for the indicator variable measuring informal selection (creaming) are now statistically non-significant on all three outcomes, as are two of the there coefficients for the indicator variable for formal selection. The coefficient for formal selection that remains statistically significant is for the overall SCE outcome. Thus, controlling for the mean social class of schools suffices as a control for the two measures of selection effects included in the model, for the case where fourth year attainment is the outcome considered. This suggests that factors associated with post-compulsory schooling may explain selection effects associated with overall SCE attainment.

The estimates for this model suggest that there is greater slope heterogeneity among sectors than revealed by the analysis in table 11.3. In particular, all of the sector effects for modern schools on social class slopes and two of the sector effects on slopes for siblings are statistically significant in the present model, whereas the previous version of the model suggested that the sector effects on social class slopes for only two of the outcomes were statistically significant. The estimates indicate that the regression of attainment on social class is flatter in the modern schools than in the other two sectors, and that the regression of sibship size is steeper in the modern schools. The effect noted in the previous chapter whereby the estimate of mean attainment for the sector(s) with the less advantaged social class profiles improve and those with the more advantaged profiles deteriorate is found in this analysis also. This finding holds across all three outcomes, and indicates that either the teaching and learning environment in the less advantaged sectors is inhibiting pupil attainment, or that the mean social class measure is controlling for selection effects that are otherwise not included in the model. The finding above that the introduction of the mean social class of schools into the model

substantially reduces the effects associated with the selectivity indicators supports the latter interpretation.

Do differences in school process explain the sector effects ?

In the last section it was found that subsequent to the inclusion of the mean social class of schools in the model the only mean sector effects on attainment that were statistically significant were those for the overall SCE measure for both sectors, and for the Victorian schools on fourth year arithmetic. However, because of the uncertain status of the construct of mean social class—is it a proxy for a selection effect, or a proxy for school process—we step back one stage to the between-school model which contains only the sector and selectivity effects (equations 11.6, 11.9, 11.10). The estimates for the earlier model indicated sector effects for modern schools on all three outcomes, and for Victorian schools on overall SCE attainment, and on fourth year arithmetic attainment (table 11.3).

The modelling strategy in this part of the chapter follows that described in the previous chapter. Several of the effects contained in the sector models developed in the preceding sections are not statistically significant, and these are omitted from the models constructed to explain variation in mean attainment between schools and sectors. The school process factors relating to instruction and the influence of significant others are then introduced into the model as a means of explaining this variation between schools, and of investigating the behaviour of the sector effects. Since there are several school process constructs to be considered, and interest relates to their effects on both the estimates of school quality and school equity, this model building process is necessarily of an iterative nature. The school process factors are entered into the model in an order determined from an assessment of their potential to account for additional variation in the estimates of the means and slopes for schools. The order of selection among the constructs is assessed by regressing each of those remaining to be included on the residuals from the model that is constructed at each step in the model building process.

The parameter estimates for the resulting model for each of the three outcomes are presented in table 11.7. Several features of the estimates in this table are important with respect to the estimates in table 11.3 for the model prior to the incorporation of the school process variables. The effects associated with the indicator variable for selective schools are substantially reduced, as are those associated with informal selection. Both the formal and informal selection effects for the two fourth year outcomes are no longer statistically significant, and those for overall SCE attainment are reduced by half. This suggests that the effects associated with the school process constructs are also associated with differences between selective and non-selective schools. This is in line with the finding above that the mean social class of schools is associated with selectivity and the finding in chapter 7 that school process and the mean social class of schools are substantially correlated.

The differentials between sectors that were evident in table 11.3 are reduced by the introduction of the school process constructs to the model. The estimated differentials between the Victorian and the modern sectors of .19 in overall SCE attainment, .08 in English, and .16 in arithmetic, are reduced to .11, .04, and .11, respectively, after the school process variables are incorporated into the model. That is, the process variables incorporated in the final model explain between one third and one half of the differential between sectors in the model. The model that includes school process constructs explains 66 percent of the variation in school mean attainment for the overall SCE outcome in the base model (table 11.2), and 61 percent of the remaining variation in the selectivity model in table 11.3. The model is slightly less effective at explaining the variation in school means for the fourth year outcomes. It accounts for between 43 percent and 50 percent of the residual variation that remained in the selectivity model (table 11.3) in these outcomes among schools. A more detailed discussion of the effects associated with the school process constructs is left until the next chapter. The remaining discussion in this section returns to the relationship between school mean social class, sector effects, and school process.

Table 11.7 Parameter estimates for the base model + selection + school process

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.333	.039	.156	.016	.192	.039
Social class slope	.032	.001	.015	.002	.018	.002
Mothers education slope	.320	.016	.292	.017	.261	.017
Siblings slope	-.101	.005	-.053	.020	-.120	.008
Gender slope	.050	.015	.295	.017	-.057	.016
Fixed sector effects for Victorian schools						
Mean attainment	.061	.028			.083	.026
Siblings slope					.029	.010
Gender slope			.095	.043		
Fixed sector effects for Modern schools						
Mean attainment	-.051	.021	-.035†	.021		
Social class slope	-.006	.001				
Fixed sector effects for non-selective schools						
Mean attainment	-.206	.037			-.075†	.040
Social class slope			.010	.002	.007	.002
Siblings slope			-.005	.021		
Fixed sector effects for uncreamed schools						
Mean attainment	.050	.018				
Fixed sector effects for school process: Instructional factors						
Teaching methods						
Mean attainment	.054	.012	.051	.016	.041	.014
Social class slope	-.002	.001			-.002	.001
Good teacher						
Mean attainment					.037	.017
Gender slope			.072	.026		
Truant S2-S4						
Mean attainment	.024	.010			.031	.011
Homework set						
Mean attainment			.029†	.017		
Fixed sector effects for school process: Influence of significant others						
School work encouraged						
Mean attainment			-.040	.017		
Social class slope			.002	.001		
Parental support for staying on						
Mean attainment	.114	.012	.107	.016	.091	.013
Peers took school seriously						
Mean attainment	.036	.012	.044	.014	.036	.013
Gender slope			.034†	.021		
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school Means	.012	697 400	.023	765 402	.015	732 401

† coefficient not statistically significant at the .05 level.

Table 11.8 Parameter estimates for the base model + selection + school process + mean social class

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.262	.041	.155	.016	.142	.040
Social class slope	.031	.001	.012	.002	.016	.002
Mothers education slope	.315	.016	.285	.017	.256	.017
Siblings slope	-.100	.005	-.040	.021	-.119	.008
Gender slope	.049	.015	.295	.017	-.058	.016
Fixed sector effects for Victorian schools						
Mean attainment	.052†	.027			.065	.026
Siblings slope					.030	.010
Gender slope			.094	.042		
Fixed sector effects for Modern schools						
Mean attainment	-.040†	.020	-.021†	.021		
Social class slope	-.006	.001				
Fixed sector effects for non-selective schools						
Mean attainment	-.125	.040			-.014†	.042
Social class slope			.013	.003	.009	.002
Siblings slope			-.067	.021		
Fixed sector effects for uncreamed schools						
Mean attainment	.039	.018				
Fixed sector effects for mean social class of schools						
Mean attainment	.012	.002	.012	.003	.011	.003
Fixed sector effects for school process: Instructional factors						
Teaching methods						
Mean attainment	.052	.012	.045	.015	.041	.014
Social class slope	-.002	.001			-.002†	.001
Good teacher						
Mean attainment					.034	.025
Gender slope			.074	.025		
Truant S2-S4						
Mean attainment	.019†	.010			.026	.011
Homework set						
Mean attainment			.026†	.016		
Fixed sector effects for school process: Influence of significant others						
School work encouraged						
Mean attainment			-.048	.017		
Social class slope			-.002	.001		
Parental support for staying on						
Mean attainment	.095	.012	.088	.016	.071	.013
Peers took school seriously						
Mean attainment	.029	.012	.036	.014	.029	.013
Gender slope			.035†	.021		
Random Effects	Variance	c^2 df	Variance	c^2 df	Variance	c^2 df
Residual variation among school Means	.011	665 399	.023	746 401	.014	701400

† coefficient not statistically significant at the .05 level.

School mean social class is now introduced into the above model. The findings from the previous section (table 11.6) would suggest that this will further reduce the magnitude of the effects associated with sectors, however, it is important to assess the extent to which this effect is ameliorated by the extension of the model to include aspects of school process. Since the introduction of school process constructs also resulted in a reduction in the sector differentials, the mean social class of schools may now reduce the estimates of the magnitude of the effects associated with the school process constructs themselves. The estimates for the previous selectivity plus school process model augmented with a measure of school mean social class are presented in table 11.8. The estimates of the effects for the Victorian and modern sectors are further reduced by about twenty percent for overall SCE attainment, and for arithmetic, but not for English. The estimates of effects associate with school selectivity are also reduced by the inclusion of school mean social class in the model. The differentials associated with formally selective schools are now statistically non-significant for attainment in the two fourth year outcomes, and less than one third of their original magnitude (table 11.3) for the overall measure of SCE attainment.

The effects associated with the four school based instructional factors are only marginally affected by the introduction of school mean social class into the model. The effects on mean attainment that are associated with the influence of significant others are affected to a greater extent; the reduction in this set of coefficients being of the order of 12 - 20 percent. These changes are, however, much less than those associated with the coefficients for the effects of the selectivity indicators on school mean attainment discussed above, for which the reductions in coefficient estimates subsequent to the addition of school mean social class into the model range from 18 - 80 percent.

Discussion

The Scottish system of public secondary schools can be thought of as evolving through four major phases in its development. For the first three decades after the formal intervention of the state that established a national system the emphasis was almost entirely on the development of an elementary school system. The secondary school system that existed during these last years of the reign of Victoria comprised schools that had been founded in earlier times as Grammar schools and Academies, plus those developed as an act of civic responsibility by the Town Councils and Burgh Authorities during the nineteenth century. Sixty-six of the schools existing today are direct descendants of these earlier schools. The first tranche of schools established within the national system with specific aims to teach more than the *elements* were the Higher Grade schools established mainly in the first two decades of the post-Victorian era. Since that time there have been two major structural changes in the organisation of secondary education in Scotland. The first was as a result of the 1918 Act which incorporated the Catholic schools into the national system, but which also laid the foundation for the structure of junior and senior high schools that were to form the basis of the system until the *comprehensive* reforms of the 1960s. Since the mid-1960s the system has been progressively transformed into a fully comprehensive school system.

The comprehensive reforms resulted in the amalgamation and reorganisation of schools that had earlier catered for substantially different client groups. Since the War the system had operated on the basis of selection at age eleven. The more able pupils embarking on a five or six year course in a senior high school, and the less able being channeled into vocationally oriented three year courses in junior high schools.

The differentiation in the system between junior and senior high schools reflected the three earlier phases of historical development of the system. Within the senior high school sector

there were the schools that had been established prior to the state's direct interest in secondary education, the Victorian schools, and the schools that were the vanguard of the national system's expansion into secondary schooling in the early decades of this century, the post-Victorian schools. The junior high schools formed the basis of what have been referred to in the present discussion as the modern school sector, that is those that have gained their full six-year status since the time of the reforms of the early 1920s that established the junior/senior secondary system, but principally since comprehensive reorganisation.

This chapter has assessed the evidence for the persistence of historical divisions associated with these stages in the development of the system, and investigated explanations for them that are based on differences in the intakes to schools, and the variation in school processes.† Evidence is found for a difference in effectiveness between sectors of todays schools that relate directly to these three earlier phases of development. Although there is little evidence of differential attainment between the modern and post-Victorian sectors before adjusting the estimates for pupil background characteristics, the Victorian sector has a higher level of mean attainment than these two sectors. However, after adjusting for the characteristics of the social background of pupils, more significant differentials between all three sectors emerge. The mean attainment of pupils in the Victorian sector is estimated to be between 2 and 13 percent of a standard deviation above that of the post-Victorian sector, and the mean attainment of pupils in the modern sector is estimated to be 5 to 7 percent of a standard deviation below the post-Victorian sector.

The addition of controls for the selectivity of schools that are formally selective or which are subject to informal selection, through the creaming off of their more able or more advantaged pupils by schools that are formally selective, reduces these sector effects by 2 to 4 percentage points for the Victorian sector, and by about 2 percentage points for the modern sector. When the analysis was restricted to only those schools that were designated not to be

† As in the previous chapter, conclusions about the influence of school process factors on differences in sector performance are dependent upon the validity of the pupil reports on which these measures are based. Although there is no evidence that they are unreliable or biased indicators of the actual processes that occurred in these schools, this is not the conventional method employed to assess the process characteristics of schools. The Rutter *et al* (1979) study, for example, employed systematic observation methods to obtain measures of school process.

subject to formal or informal selection, the sector differentials were all found to be statistically non-significant. This suggests that the sector effects noted above may be due to unmeasured selection effects. However, this subsample of schools comprises only about one third of the schools in the system, and it excludes all schools in the major cities and larger towns. Subsequent analyses suggested that this finding of no differentials among the three sectors in this subsample may be due to factors associated with the exclusion of city schools.

The inclusion of the mean social class of schools in the model reduces the estimates of sector differentials that were found in the full sample of schools. Most of the sector effects are reduced by about one third, with the largest being 8 percent of a standard deviation. The coefficients associated with the selectivity indicators are also significantly reduced in this model, indicating that the mean social class of schools is associated with a large proportion of the variation that is controlled for by the selectivity indicators. Only the selectivity indicator for the overall SCE attainment measure remains statistically significant in this model.

Similar effects were found when the school process measures were entered into the model. Again the changes were found to be greatest for the two fourth year outcomes. This suggests that some of the portion of variation between schools in fourth year English and arithmetic attainment that was formerly accounted for by the selectivity indicators may also be explained by differences in school process between selective and non-selective schools.

The final model which includes the measures of school process and the social class of school intakes accounts for 73 percent of the variation in mean SCE attainment among schools, 45 percent of the variation in fourth year English attainment, and 58 percent of the variation in fourth year arithmetic attainment. This model also exhibits the reductions in the effects associated with the selectivity indicators discussed above. The school based instructional constructs are only marginally lower in this model

than when the mean social class of schools is omitted. However, the process constructs associated with the influence of significant others were reduced by between 12 and 20 percent by the inclusion of the mean social class of schools in the model. The sector effects in this final model indicate that mean attainment in the Victorian sector is no higher than that in the post-Victorian sector for overall SCE attainment, and for fourth year English, but that it is 7 percent of a standard deviation higher for fourth year arithmetic. The sector effects for the modern school sector are all statistically non-significant, indicating that the mean level of attainment in this sector is no different to that in the post-Victorian sector. Thus, although there are differences in mean attainment among the three sectors, even after adjusting for differences in the social background characteristics of their pupils, these differences can almost all be accounted for by variation among sectors in school processes, the mean social class of schools, and selectivity effects.

Chapter 12

An Instructional Effects Model of Variation in Attainment Among Schools

Introduction

The analyses in chapter 7 indicated that some of the school process constructs developed there have moderately strong correlations with the mean unadjusted estimates of attainment for schools. These constructs were employed in the modelling of attainment in chapters 10 and 11. When combined with a measures of school intake composition, indicators of selectivity, and indicators of sector membership, the process constructs explained a substantial proportion of the variation between schools. However, the focus of the modelling in these last two chapters has been on the behaviour of the sector indicators, with the main attention being given to investigating the question of whether there is systematic variation between sectors within the system.

The modelling strategy thus employed the school process constructs as a means of modelling variation that remained after the inclusion of the various sector and selectivity indicators, and the school composition measure. In this chapter the focus is placed more directly on the process measures themselves, with the indicators of sectors and the measure of school intake composition playing a subsidiary role. The objective is to construct a parsimonious school process model to account for variation between schools. The process constructs that were shown in chapter 7 to be related to the mean attainment of schools can be divided into three groups: one relating to instructional activities at school and to out of school learning; a second that relates to the social-psychological construct of the 'influence of significant others', and a third that relates essentially to pupil's assessments of aspects of thé social outcomes of schooling. The model developed in this chapter focuses

on the first set of these constructs.The literature is equivocal as to whether the last of these should be considered an outcome of schooling or whether it should be interpreted as an indicator of the ethos and climate of schools. The face validity of the measures as indicators of school ethos or climate is, however, questionable, particularly as the responses are likely to have been contaminated by pupil's reassessment of their school years in light of their achievements at school. For this reason the measures that were described in chapter 7 as the social outcomes of schooling will not be included in the analyses in this chapter as potential causes of the variation in attainment between schools. The constructs measuring aspects of the influence of significant others will also not be considered in this model as they are not direct indicators of instructional aspects of the teaching and learning environment.

Modelling strategy

The potential of the instructionally related constructs to explain the variation between schools is now considered. The variation between schools is first modelled using these seven constructs. Subsequently, the indicators of selectivity, school sectors, and intake composition will be added to the model where it is shown that they make an additional contribution to the explanation of the variation between schools. This, reverses the model building strategy employed in the two previous chapters, where sector and selectivity indicators were employed as the principal explanatory factors in the model. If all of the constructs employed in the model building process were independent and therefore made additive contributions to the explanation of the variation in quality and equity between schools, then the two strategies would converge to the same final model. However, as the constructs employed in this analysis are not statistically independent of each other the two strategies may result in different final models.

If these two approaches arrive at different final models, they need not be viewed as providing contradictory interpretations of the variation in the data, but, rather of providing views of the structure of variation among the constructs from somewhat different perspectives. The distributions of the school process constructs were found to vary among the sectors considered in chapters 10 and 11. This raises the basic conceptual question of the extent to which the explanatory power of the variation in process between schools is a function of sector *per se* or of variation in process. If the contributions of sector and process to the explanation of variation in mean attainment among schools were additive this would pose only a trivial question. However, the analyses in the previous two chapters have, in general, indicated that the contributions of the various sets of factors are not strictly additive. The strategy employed in these two chapters assigned priority to the *sectors* as explanatory factors in the models. The models developed below assign priority to the school process factors, with the variation associated with sectors being employed in a subsidiary role.

An instructional effects model

The seven instructionally related constructs employed here are: *teaching methods, good teacher, homework set, homework texts, extra teaching - paid tutor, extra teaching - other, and truant S2-S4.* These constructs have been selected after a set of exploratory analyses that tested the relationship between each of the constructs developed in chapter 7 with estimates of school means adjusted for the background characteristics of pupils. In the main, these are the constructs that were found in chapter 7 to have the strongest correlations with the unadjusted means. The constructs labelled *classroom process* and *teaching methods* in chapter 7 were found to be highly correlated (r=.87), and the former construct is dropped from further consideration in order to avoid statistical problems associated with collinearity in the models developed.

The first model considered employs these constructs as measures to explain variation in the between-school part of the model. The *within-school* model is specified by:

$$y_{ij} = \beta_{j0} + \beta_{j1}X_{ij1} + \ldots\ldots\ldots + \beta_{j4}X_{ij4} + \varepsilon_{ij} \qquad 12.1$$

and the *between-school* model is

$$\beta_{j0} = \delta_0 + \kappa_{01}V_{j1} + \ldots\ldots\ldots + \kappa_{0n}V_{jn} + \mu_{j0} \qquad 12.2$$

$$\beta_{jk} = \delta_k + \kappa_{k1}V_{j1} + \ldots\ldots\ldots + \kappa_{kn}V_{jn} + \mu_{jk} \qquad 12.3$$

where, 12.3 is repeated for each of the k = 1, 2, 3, 4, slope parameters in 12.1. This model treats school intercepts and slopes as random effects that are modelled as a function of the *n* school process variables(the V_{jn}).

The estimates of the parameters in this model are presented in table 12.1. The first point to note from these estimates is that the within-school slopes are steeper for the social class and mothers' education covariates for the overall SCE attainment measure than for the two fourth year single subject outcomes.[1] The differential in attainment between boys and girls ranges from 6 percent of a standard deviation in favour of boys in arithmetic to 31 percent of a standard deviation advantage for girls in English. There is a differential of 5 percent of a standard deviation in favour of girls on the overall attainment measure. *text recommences, after tables, on page 384*

[1] As explained in chapter 6 all three of the outcome measures were standardised to have unit variance and a zero mean.

Table 12.1 Parameter estimates for instructional effects model: instructional effects only

	Overall SCE		English		Arithmetic	
Effect	s.e.	Effect	s.e.	Effect	s.e.	
Fixed mean effects for:						
Mean attainment	.139	.011	.119	.012	.128	.011
Social class slope	.029	.001	.024	.001	.025	.001
Mothers education slope	.332	.016	.291	.017	.272	.017
Siblings slope	-.102	.005	-.105	.005	-.103	.005
Gender slope	.050	.015	.309	.016	-.057	.016
Fixed instructional effects on school means:						
Teaching methods	.089	.016	.059	.018	.065	.016
Good teacher	.044	.019			.058	.019
Homework set			.047	.019		
Take texts home			.035	.016		
Extra teaching - paid tutor	.043	.012				
Extra teaching - other	.031	.013			.026	.013
Truant S2-S4	.052	.012	.027	.013	.051	.012
Fixed instructional effects on school social class slopes:						
Teaching methods					-.002†	.001
Extra teaching - paid tutor	.002	.001				
Fixed instructional effects on school siblings slopes:						
Homework set			.016	.007		
Fixed instructional effects on school gender slopes:						
Good teacher			079	.025		

Table 12.2 Parameter estimates for instructional effects model: instructional effects + selectivity indicators

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.361	.040	.220	.044	.246	.041
Social class slope	.023	.002	.014	.002	.019	.002
Mothers education slope	.327	.016	.293	.017	.270	.017
Siblings slope	-.101	.005	-.052	.021	-.103	.005
Gender slope	.050	.015	.274	.021	-.057	.016
Fixed instructional effects on school means:						
Teaching methods	.077	.016	.061	.018	.061	.016
Good teacher	.040	.019			.059	.019
Homework set			.043	.019		
Take texts home			.032†	.017		
Extra teaching - paid tutor	.032	.012				
Extra teaching - other	.024†	.013			.021†	.013
Truant S2-S4	.041	.012	.025†	.013	.045	.012
Fixed selectivity effects on school means:						
Non-selective schools	-.269	.043	-.125	.047	-.154	.044
Uncreamed schools	.068	.022	.057	.024	.061	.022
Fixed instructional effects on school social class slopes:						
Teaching methods					-.002†	.001
Good teacher						
Extra teaching - paid tutor	.002	.001				
Truant S2-S4						
Fixed selectivity effects on school social class slopes:						
Non-selective schools	.006	.002	.011	.002	.007	.002
Uncreamed schools						
Fixed instructional effects on school siblings slopes:						
Homework set			.014	.007		
Fixed selectivity effects on school siblings slopes:						
Non-selective schools			-.055	.021		
Uncreamed schools						
Fixed instructional effects on school gender slopes:						
Good teacher			.093	.026		
Fixed selectivity effects on school gender slopes:						
Non-selective schools						
Uncreamed schools			.082	.032		
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school Means	.026	401 955	.035	402 939	.024	402 900

Table 12.3 Parameter estimates for instructional effects model: instructional effects + selectivity + sectors

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.374	.041	.258	.044	.247	.044
Social class slope	.031	.001	.014	.002	.019	.002
Mothers education slope	.323	.016	.290	.017	.266	.017
Siblings slope	-.118	.005	-.120	.006	-.120	.006
Gender slope	.051	.015	.332	.017	-.072	.020
Fixed instructional effects on school means:						
Teaching methods	.064	.015	.045	.018	.052	.015
Good teacher	.035†	.018			.055	.019
Homework set			.040	.018		
Take texts home			.037	.016		
Extra teaching - paid tutor	.028	.012				
Extra teaching - other	.026	.012			.022†	.012
Truant S2-S4	.040	.011	.028	.013	.043	.012
Fixed selectivity effects on school means:						
Non-selective schools	-.254	.041	-.096	.044	-.147	.043
Uncreamed schools	.050	.021			.046	.022
Fixed sector effects on school means:						
Victorian non-denom	.074	.030			.091	.030
Modern non-denom	-.102	.022	-.123	.024	-.055	.023
Fixed instructional effects on school social class slopes:						
Teaching methods					-.002†	.001
Extra teaching - paid tutor	.002	.001				
Fixed selectivity effects on school social class slopes:						
Non-selective schools			.010	.002	.007	.002
Uncreamed schools						
Fixed sector effects on school social class slopes:						
Modern non-denom	-.005	.001	-.001†	.002		
Fixed instructional effects on school siblings slopes:						
Homework set			.010	.007		
Fixed sector effects on school siblings slopes:						
Modern Catholic	.073	.011	.066	.012	.077	.012
Fixed instructional effects on school gender slopes:						
Good teacher			.083	.025		
Fixed sector effects on school gender slopes:						
Modern non-denom					.040	.033
Modern Catholic			-.130	.041		
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school Means	.021	399 890	.031	402 903	.022	400 866

Table 12.4 Parameter estimates for instructional effects model: instructional effects + selectivity + mean social class

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.240	.041	.104	.045	.133	.041
Social class slope	.019	.003	.010	.002	.014	.002
Mothers education slope	.318	.016	.283	.017	.257	.017
Siblings slope	-.098	.005	-.044	.021	-.118	.006
Gender slope	.049	.015	.286	.021	-.058	.016
Fixed instructional effects on school means:						
Teaching methods	.065	.014	.053	.017	.052	.015
Good teacher	.027	.018			.041	.018
Homework set			.035	.018		
Take texts home			.036	.015		
Extra teaching - paid tutor	-.001†	.012				
Extra teaching - other	.009†	.012			.010†	.012
Truant S2-S4	.027	.011	.015†	.012	.034	.011
Fixed selectivity effects on school means:						
Non-selective schools	-.110	.045	.025†	.050	.001†	.044
Uncreamed schools	.040†	.021	.028†	.023		
Fixed intake effects on school means:						
Mean social class of intake	.023	.003	.017	.003	.019	.002
Fixed instructional effects on school social class slopes:						
Teaching methods					-.001†	.001
Extra teaching - paid tutor	.002	.000				
Fixed selectivity effects on school social class slopes:						
Non-selective schools	.010	.003	.015	.002	.010	.002
Uncreamed schools						
Fixed instructional effects on school siblings slopes:						
Homework set			.015	.007		
Fixed selectivity effects on school siblings slopes:						
Non-selective schools			-.061	.021		
Uncreamed schools						•
Fixed sector effects on school siblings slopes:						
Modern Catholic					.078	.012
Fixed instructional effects on school gender slopes:						
Good teacher			.070	.026		
Fixed selectivity effects on school gender slopes:						
Non-selective schools						
Uncreamed schools			.072	.032		
Fixed intake effects on school gender slopes:						
Mean social class of intake			.014	.003		
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school Means	.019	400 816	.029	401 845	.019	402 787

Table 12.5 Parameter estimates for instructional effects model: instructional effects + selectivity + sectors + mean social class

	Overall SCE		English		Arithmetic	
	Effect	s.e.	Effect	s.e.	Effect	s.e.
Fixed mean effects for:						
Mean attainment	.257	.041	.175	.014	.160	.043
Social class slope	.030	.001	.010	.002	.015	.002
Mothers education slope	.313	.016	.282	.017	.257	.017
Siblings slope	-.116	.005	-.118	.006	-.118	.006
Gender slope	.049	.015	.330	.017	-.073	.021
Fixed instructional effects on school means:						
Teaching methods	.054	.014	.037	.016	.046	.015
Good teacher	.021†	.017			.043	.018
Homework set			.033†	.017		
Take texts home			.040	.015		
Extra teaching - paid tutor	.001†	.011				
Extra teaching - other	.013†	.012			.010†	.012
Truant S2-S4	.029	.011	.016†	.012	.033	.011
Fixed selectivity effects on school means:						
Non-selective schools	-.086	.041			-.024†	.045
Uncreamed schools					.024†	.021
Fixed sector effects on school means:						
Victorian non-denom	.039†	.028			.053†	.029
Modern non-denom	-.109	.021	-.111	.022	-.059	.022
Fixed intake effects on school means:						
Mean social class of intake	.021	.002	.016	.002	.017	.002
Fixed instructional effects on school social class slopes:						
Teaching methods					-.001†	.001
Fixed selectivity effects on school social class slopes:						
Non-selective schools			.015	.002	.010	.002
Uncreamed schools						
Fixed sector effects on school social class slopes:						
Modern non-denom	-.006	.001				
Fixed instructional effects on school sibling slopes:						
Homework set			.011†	.007		
Fixed sector effects on school sibling slopes:						
Modern Catholic	.075	.011	.068	.012	.077	.012
Fixed instructional effects on school gender slopes:						
Good teacher			.061	.026		
Fixed sector effects on school gender slopes:						
Modern non-denom					.038†	.033
Modern Catholic			-.074†	.043		
Fixed intake effects on school gender slopes:						
Mean social class of intake			.013	.003		
Random Effects	Variance	χ^2 df	Variance	χ^2 df	Variance	χ^2 df
Residual variation among school Means	.016	399 773	.025	402 810	.018	399 768

The instructional constructs that enter all three models are those for teaching methods and for truancy. The relationship between the teaching methods construct and attainment is stronger for the overall SCE measure than for the two fourth year outcomes. The truancy construct has a weaker relationship to fourth year attainment in English than to attainment on the other two outcomes. The construct labelled good teacher makes a statistically significant contribution to the explanation of overall SCE attainment, and to the explanation of arithmetic attainment. The two constructs relating to the setting of homework and whether pupils were allowed to take textbooks home both make a contribution to the explanation of attainment in English, but not to the other two outcomes. The constructs relating to additional tutoring and instruction by a paid tutor or by someone else both contribute to the explanation of attainment on the overall SCE outcome, but only the second of these is important for explaining fourth year arithmetic attainment, and neither contribute to the explanation of attainment in fourth year English.

There are only a few instances where the instructional items make a statistically significant contribution to the explanation of the variation in equity among schools. Perhaps the main finding to note here is the contribution of *extra teaching by a paid tutor* to the variation in social class slopes among schools. The positive sign of this coefficient indicates that the effect of this is to increase the differential between manual and non-manual social class pupils in schools. The other findings suggest that the setting of homework ameliorates the effects of sibship size on attainment in English, and that having a *good teacher* is of more benefit to girls than to boys. This model accounts for 30 percent of the variation in parameter variance in mean attainment between schools for the overall SCE measure, 24 percent for arithmetic, and 17 percent for English.

The estimates for the model with the selectivity indicators added are presented in table 12.2. The addition of selectivity indicators for formal and informal selection in the system increases

the variance explained to 38 percent for the overall SCE measure, and to 27 percent for arithmetic, but it does not add to the variance explained in school mean attainment in English. Overall there is little change from the previous model in the within-school slopes. The estimates of the mean effects for the instructional constructs included in the model are generally reduced by about 10 percent, although those relating to extra teaching are reduced by about twice this amount. This suggest that the more selective schools generally have more favourable process environments, and that the effects of extra teaching, in particular, are stronger in the more selective schools. The estimated differential between the formally selective schools and the creamed schools ranges from 13 percent of a standard deviation in English to 27 percent in overall SCE attainment, while the differential between creamed and uncreamed schools is about 6 percent for all three outcomes. However, the model does not include any measure of pupil ability, thus these cannot be interpreted as estimates of performance differentials between selective and non-selective schools. Their value here is diagnostic in that it provides a baseline estimate against which to judge the effects associated with selectivity in the more elaborated models introduced below.

Tables 12.3 and 12.4 present estimates for further elaborations of this model. The estimates in table 12.3 relate to the above model with sector indicators added. The sector indicators employed here are a combination of those employed in earlier chapters to describe the denominational status of schools and those describing the stage of the development of the system at which individual schools were founded. The analyses in the previous chapters found differences between only some of these sectors, and that the estimates of sector differentials varied across the three outcomes considered. Here a fivefold classification is employed that delineates sectors as: Victorian, post-Victorian, and modern, for non-denominational schools, and post-Victorian and modern, for Catholic schools. There are three Victorian Catholic schools in the data, but these have been combined with the six post-Victorian Catholic schools for the

purposes of the present analysis. This typology of sectors is the same as that employed by McPherson and Willms (1986).

The only sector that has an independent effect across all three outcomes is the modern non-denominational sector. The estimates of mean attainment for this sector are from 6 to 12 percent of a standard deviation below that for the other sectors. The Victorian non-denominational sector is estimated to have a mean level of attainment that is 7-9 percent above the remaining sectors for the overall SCE measure and for fourth year arithmetic, respectively. The introduction of the sector indicators has relatively little impact on the estimates of within-school slopes for social class and mothers education. However, it is associated with an increase in the gender differential for English. This increase is accompanied by a decrease in the gender effects associated with the good teacher construct. The gender differentials for the other two outcomes are unaffected by the introduction of the sector indicators. The estimates for the effects of the school process constructs relating to teaching methods and good teacher on mean attainment are reduced by about 10 percent compared to those for the previous model. The remaining effects are stable or slightly increased in the present model. These findings suggest that the effects of the two teacher based instructional constructs are associated with the sector effects in this model. The differentials associated with the selectivity indicators are also reduced by the addition of the sector indicators to the model. The cumulative impact of the inclusion of the selectivity and sector indicators on the estimated effects for the instructional constructs is to reduce them by about 20 percent, on average. The largest reduction is for the construct associated with extra teaching by a paid tutor (35%). The reduction in these instructional effects is greater for the overall SCE attainment outcome (average reduction - 25%) than for the two fourth year outcomes (average reduction of 12% for English, and 15% for arithmetic).

The model explains 48 percent of the parameter variance in school means in overall SCE attainment for the base model discussed earlier. It explains less of the variation in attainment in fourth year outcomes; 33 percent in arithmetic, and 26 percent in English. The addition of the sector indicators accounts for 6 to 8 percentage points of this explained variation in school means.

The estimates in table 12.4 are for the model with selectivity indicators included, plus the addition of mean social class of school intakes. But it does not contain the sector indicators from the previous model. The addition of the mean social class of school intakes to the model has relatively little effect on the estimates of within-school slopes, compared to the model which included only the selectivity indicators in addition to the school process measures. Again in this model there is an increase in the estimated gender differential in English, which is also accompanied by a reduction in the gender effects associated with the good teacher construct. Taken together this suggests that although the gender differential associated with this instructional effect is reduced, other effects related to the mean social class of schools result in a general strengthening of the gender differential. The estimates of the effects associated with the instructional constructs are also reduced in this model, compared to the same model that omits the mean social class of school intakes. The reduction is greater than that found in the sector model above for all constructs except for the *teaching methods* construct. Compared to the base model (table 12.2) there is an average reduction of about a third in the estimates of process effects. The reduction is much larger, however, for the *extra teaching* and *truancy* constructs (reduced by more than 33%in all cases) than for the *teaching methods* and *good teacher* constructs (reduced by 11 - 39%). The estimates for the effect of the two *extra teaching* constructs on mean attainment are statistically non-significant for all three outcomes in this model. In addition, the *truancy* construct is statistically non-significant for mean attainment in English.

The effects associated with the selectivity indicators are substantially reduced in this model. The effects of informal selection are statistically non-significant on all three outcomes, as is the formal selection indicator for the two fourth year outcomes. The differential between selective and uncreamed non-selective schools for overall SCE attainment is reduced from -.27 in the model before the addition of school mean social class to -.11 after the inclusion of the later in the model.

This model explains 53 percent of the parameter variance in mean SCE attainment between schools, 42 percent of the variation in mean attainment in arithmetic, and 31 percent of the variation in mean attainment in English. The mean social class of schools contributes about an additional 14 percentage points of explanatory power to the model.

The final instructional effects model considered is one which incorporates all four sets of factors: instructional process constructs, selectivity indicators, indicators of sector membership, and the mean social class of school intakes. The estimates for this model are presented in table 12.5. If the effects of the models estimated thus far were all independent after the inclusion of school process constructs, then the estimates of variation in school means explained in table 12.5 would be 61, 41, and 49 percent, in overall SCE attainment, English, and arithmetic, respectively. The model explains 60 percent of the variation in mean SCE attainment, 41 percent of the variation in mean English attainment, and 46 percent of the variation in mean arithmetic attainment. Thus, the effects of the four sets of factors are almost completely additive. The independence of the contribution to the model of the sector and mean social class effects is confirmed by a comparison of the the estimates for these effects in this model with those in tables 12.3 and 12.4. The differences are marginal, with the exception of the effect for the Victorian non-denominational sector, which is reduced to statistical non-segnificance by the inclusion of the eman

social class of schools in the model. The only sector effect of any import in the full model is that associated with the modern non-denominational sector. Thus, after taking account of instructional process, indicators of selectivity, and mean social class influences, on the variation in mean attainment between schools there is no remaining variation between sectors, with the exception of that associated with the modern non-denominational sector. This sector has a mean level of SCE attainment overall, and for fourth year English, that is estimated to be about 10 percent of a standard deviation below the average for all other sectors. It is estimated to be about 6 percent of a standard deviation below in mean arithmetic attainment. Other than this, there is no evidence in this final model of any residual sector effects associated with the denominational status of sectors, or of any general effects associated with the stage of development at which schools were founded.

The analyses of models for which the estimates are shown in tables 12.3 and 12.4 have indicated that the effects of the school process constructs are affected by the introduction of sector indicators and mean social class into the model. The average reduction in the size of the effect associated with the *teaching methods, good teacher, homework set,* and *truancy* constructs by about one third, compared to their magnitude in the same model with these factors excluded. The effects associated with *extra teaching* are statistically non-significant in this final model. Thus, about one third of the effects that could be attributable to instructional process factors are jointly attributable to variation between the modern non-denominational sector and all other sectors combined, and to variation in the mean social class of school intakes. The reduction in the effects of the process constructs are greatest for the overall SCE measure (range 39-100%), and least for arithmetic (range 14-61%), with the effects on their effects for English being about midway between these extremes.

The selectivity indicators are also markedly reduced in the final

model compared to the estimates for them when they were first introduced in the model (table 12.2). The addition of school mean social class and sector indicators to the model reduces the differential in overall SCE attainment between selective schools and uncreamed comprehensives by about 70 percent. Less than 10 percentage points of this reduction is due to variation between sectors. The estimated coefficients for this differential for the two fourth year outcomes are statistically non-significant in this model. Thus, all of the initial variation in mean attainment between schools in English and arithmetic, and two thirds of the variation in overall SCE attainment, that is associated with the selective nature of school intakes is explained by the model.

Although this model explains 60 percent of the variation in mean SCE attainment among schools, 46 percent of the mean attainment in fourth year English, and 41 percent of the mean attainment in fourth year arithmetic, the test of residual variation in school means presented in the bottom panel of table 12.5 indicates that there is additional statistically significant variation in mean attainment among schools that is not explained by the model. The model is much less successful at explaining the variation in equity among schools. There is only a very small variance component associated with social class slopes, and the model explains none of this. It explains about 40 percent of the variation in slopes associated with sibship size. Only 2 percent of the variation among schools in gender differentials for arithmetic attainment is explained, but somewhat more for the other two outcomes;12 percent for overall SCE attainment, and 23 percent for English attainment.

Discussion

The previous two chapters employed school process constructs to explain sector effects. This chapter has reversed this approach and investigated the effects that can be attributed to school process

before employing sector indicators to explian the remaining variation in attainment among schools. The difference in practice in developing the models using these two approaches is that the approach employed in this chapter assigns the school process causal priority over the sector indicators. If the differences in attainment among schools are associated with sectors after conditioning on the effects of school process, then there are additional non-process related aspects of the sectors that are associated with attainment. Although, such an interpretation is subject to the qualification that other unmeasured aspects of school process could also explain these sector differentials. The school process constructs included in the models in the present chapter have been restricted to those that relate to the direct instructional environment. The models in chapters 10 and 11 employed additional process constructs that are only indirectly related to instructional aspects of the teaching and learning environment, and which may be less amenable to modification through changes in policy and practice.

The instructional constructs by themselves account for almost one third of the variation in overall SCE attainment among schools, and about one fifth of the variation in fourth year English and arithmetic attainment. The addition of indicators of formal and informal selectivity adds about 8 percentage points to the explanatory power of the model for overall SCE and arithmetic attainment, but little to the explanation of English attainment. The two instructional factors which influence attainment on all three outcomes are the *teaching methods* and *truancy* constructs. In addition, the *good teacher* construct is found to be influential in explaining overall SCE attainment. Additional tutoring is also found to be related to differences in attainment among schools for the two fourth year outcomes, but not for overall SCE attainment. The effects for these instructional factors are reduced by about ten percent after the inclusion of the selectivity indicators in the model.

This chapter employed a classification of sectors that crossed the factor of the denominational status of schools used in chapter 10 with the era in which a school was founded, used in chapter 11. This resulted in five categories of schools, as the three Victorian Catholic schools were, for the purposes of the analysis, included in the Post-Victorian Catholic school sector. Only the modern non-denominational sector was found to have a different level of mean attainment across all three outcomes. The estimates of mean attainment for this sector are 6 - 12 percent below those for the other sectors. The Victorian non-denominational sector was found to have a performance that is about 8 percent above the other sectors for the overall SCE and arithmetic outcomes, but not for English. The introduction of these sector indicators into the model reduces the effects associated with the instructional constructs by up to 10 percent, and it significantly increases the explanatory power of the model, by between six and ten percentage points. An alternative model that includes the instructional constructs plus the mean social class of schools accounts for between 5 and 9 percentage points more in the variation in attainment among schools than this sector model.

The final model considered included all four sets of factors: instructional constructs, selectivity indicators, sector indicators, and the mean social class of schools. This model explains 60 percent of the variation in overall SCE attainment among schools, and about 40 percent of the variation in fourth year English and arithmetic attainment. The effects associated with the instructional process constructs are reduced by about one third in this model compared to the base model in which they were the only explanatory factors. That is, about one third of the effect associated with these process constructs is also explainable by the combination of the selectivity, sector, and mean social class indicators in the model. The only sector effect found to be statistically significant in this final model was that for the modern non-denominational sector, and the differential levels of attainment for fourth year outcomes between selective and non-selective

schools was fully accounted for by the model. Seventy percent of the differential in overall SCE attainment between selective and non-selective schools was also accounted for by this model.

These general conclusions regarding the power of the model to account for sector and selectivity differentials in attainment among schools are in accord with the findings from the previous two chapters. However, the present chapter has considered only instructionally related school process constructs. Provided these measures of school process based on pupil reports are valid indicators of the actual processes that occurred, the findings of the present chapter adds to those of thee earlier chapters by showing that this particular domain of school process provides the basis of an explanation that is practice based. Hence, it offers the possibility that variation in attainment among schools might be reduced if more favourable practices could be introduced into the lower attaining schools.

Chapter 13

Discussion and Conclusions

Introduction

This chapter is divided into three sections that summarize the main findings from the study and discuss their implications for further research in this area, and for current educational policy initiatives.

The main findings and conclusions

Over the past decade schooling has undergone substantial changes that have emanated both from new policies and from external demographic and economic forces. The declining size of the secondary age cohort that commenced in 1979 will continue until 1992. The trough in enrollments at the latter date will represent a decline of 32 percent from the the number in the system at the time of the 1979 peak. This substantial decline has implications for the numbers of staff required, the size of schools, the breadth of curriculum that schools can offer, and for teacher promotion prospects, among others. All of these factors will influence the effectiveness of schools as we enter the last decade of this century.

The collapse of the youth labour market over the last decade has also had a substantial effect on schooling. It was probably the single most important factor responsible for the increase in the voluntary age participation rate in post-compulsory schooling from 20 percent to 24 percent between 1979 and 1984. In addition it has led to a substantial restructuring of the post-school destinations. Whereas two thirds of school leavers went directly into employment in the mid-seventies, less than one-quarter of pupils do so today. There has been a rise from 16 percent to 26 percent who now enter full-time post-school education, but the majority of the pupils displaced by the

collapse of the labour market have been accommodated in new training programmes under the Youth Training Scheme. These programmes offer basic vocational training and some additional non-advanced education. Thus, Scotland has joined most other Western nations in retaining the two-thirds or more of its young people in the education/training system until the age of 18 years. These changes are large by any standards and have resulted in related changes in the way that pupils in schools view their learning and future prospects.

Other policy developments have also had a direct impact on the education offered by secondary schools. The TVEI programme has offered an alternative vocationally orientated curriculum to an increasing proportion of pupils in the final two years of their compulsory education. This programme offers pupils a combination of vocational skills along with basic academic courses, and is provided jointly through schools and external centres in co-operation with local industry and commerce. The introduction of the Standard Grade curriculum and examinations has restructured the academic curriculum offered by schools. In particular, it offers the less able pupil a curriculum that may be less daunting but at the same time challenging. It is an unheralded statistic that the average pupil leaves school with two passes at Ordinary Grade level under the present system, and that the average level of attainment in English and arithmetic, the two core subjects, is a D grade. That is, the average pupil spends the last two years of their compulsory schooling mastering less than 40 percent[check that this is true for those who present] of the Ordinary Grade curriculum in these subjects.

The vocational orientation of TVEI is augmented by the modules offered to pupils in post-compulsory schooling and in non-advanced further education under the Action Plan. This curriculum offers pupils thematic but non-hierarchical courses of study. Like the TVEI programme, the implementation of the Action Plan has resulted in a blurring of the institutional distinction between school and college, as schools have joined

forces with local colleges for the purposes of providing an adequate Action Plan curriculum. The above developments of the vocational curriculum offered to young people have restructured the pattern of post-compulsory education They have also influenced the curriculum in the compulsory period formally through the TVEI programme. But it is probable that they have also informally influenced pupil's perceptions of educational and vocational careers, thereby influencing their curricula choices during the last two years of compulsory schooling.

The effects of these changes on the effectiveness with which schools develop pupil's achievements have not been studied. Further, we do not know the range of and effectiveness of the practices that are associated with teaching and learning in this changed environment. The research literature on the effectiveness of schooling in the 1960s and early 1970s lead many to the conclusion that since the variation in mean attainment among schools was less than one-fifth of that which exists among individual pupils, there was little need to concern ourselves with the factors that make some schools slightly more or less effective than others. This lead to the conclusion on the part of many that there is little that could be done to improve the effectiveness of schools.

The present study has indicated that the proportion of variation that lies between schools, ie. the variation in school mean attainment, is only of the order 5 percent of the variation between pupils for a pupil of average background characteristics. However, it has shown that it is about twice this for pupils who are from relatively disadvantaged or advantaged backgrounds. Neither of these estimates of the proportions of variation in pupil attainment change the essential conclusion that much more of the variation in pupil attainment lies within schools, than between schools. However, the variation in attainment among pupils is very large, even after taking account of their social background characteristics. Although there is a definite relationship between social class and attainment, there are some pupils in all

social classes who attain at each end of the spectrum, from no SCE passes to several Highers passes. The estimated variation of two Ordinary Grade passes among schools is small by comparison. However, the comparison with variation among pupils may not be the appropriate comparison.

This study suggests that the increase in average attainment over the last decade has be of about the same magnitude, ie. about two Ordinary Grade passes. This is not usually interpreted as immaterial or worthless, indeed if progress was maintained at this rate, the average pupil in two decades time at the end of the century would be attaining at the level of four Ordinary Grades. By most interpretations this would seem a worthwhile advance to make. This is all by way of making the point that the variation in aggregates is much smaller than that among individuals. If this were not the case and, say, fifty percent of the variation in attainment lay between schools, then by reducing this variation between schools through the transfer of the best practices to the lower attaining schools, it would be possible to raise the average level of pupil attainment by more than that normally associated with the change observed over two or three generations. Changes of this order of magnitude in the performance of social institutions are usually only observed for units that have previously operated under depressed or abnormal conditions.

These arguments are of particular salience to an education system such as that which has developed in Scotland. From an initially fragmented system of parish schooling in the nineteenth century, modern schooling has evolved into a highly uniform and systematically structured system that provides access not only by right, but also compels attendance until the age of sixteen years. Although there remains variation in the system, some of which is a legacy of institutional differentiation deriving from earlier stages of in its development, there is also considerable uniformity. Schools teach similar curricula, and all pupils present for the single system of national public examinations. Further, the primary sources of teaching skills are institutionally

based and few in number. The overarching aims of development for the first century of public schooling can be viewed as those of the systematization and organisation of efficient articulation between the various stages of schooling. The implementation of the comprehensive reforms introduced in the 1960s were aimed at development of greater social uniformity in the system, in addition to enhancing the degree of educational uniformity that had evolved over the earlier decades.

The school system of Scotland today is in many respects much more uniform than that in England and Wales, and certainly more so than that in the United States. This is reflected in the the lower proportion of the variation in pupil attainment that lies between schools in Scotland, compared with that in the United States, in particular. However, this lower level of variation in attainment between schools is still of educational significance.

The institutional differentiation in the system can be viewed as the continuing manifestation of earlier organisational changes. The fact that schools are social institutions means that they are inextricably linked to the communities that they serve, and this has resulted in the sedimentation of certain structural forms as they existed in earlier times. In particular, there is a strong case for concluding that the schools established in the Victorian era may well maintain a relationship with the communities that they serve that reflects the particular advantages and status of that community in relation to others (McPherson and Willms, 1987). The relations between community and schools as social institutions are a central feature of Coleman and Hoffer's (1987) recent analysis of the performance of Catholic schools in the United States. They focus on the role of *functional* communities in transmitting social structure from one generation to the next, however, they argue that the central feature of the relationship between the social institutions of the Catholic community and its schools is the high degree of *value consistency* between the two.

Schools may relate to two different types of community. The first Coleman and Hoffer refer to as the community which is a

functional community and which also has a high degree of shared values between schools and other community institutions. The second, is a community which is not a functional community, but which has a high degree of shared values between families and their schools. The first is typified by the relationship between the Academy established possibly in Victorian times and other social institutions in, say a small single school burgh. McPherson and Willms (1987) indicate that there are a number of schools that may have a relationship of this type to the community which they serve. These are functional communities because they *are* the integrated social structures through which the commerce of life is transacted. In contrast, the community of families who send their sons and daughters to a select private school, possible some distance from their own residential home, are not part of a common functional community. What they have in common is a consistency of values, which are also consonant with those of the schools to which they entrust the education of their children. This analysis of the relationships between communities and schools suggests the need for a concept of communities as functional or as characterised by a value consensus in the context of the range of communities that exist in Scotland today.

Although the comprehensive reforms of the 1960s were accompanied by the introduction of territorial catchments, these were not defined on the basis of the functional characteristics or of the value consensus existing within the communities which they embrace. However, it is possible that a value consensus exists between some schools and the communities that they serve. This suggests that one of the reasons for the higher performance of the Victorian schools and the Catholic schools in this study may lie in a greater value consistency between school and community. For, although the models of pupil attainment employed in this study were able to account for almost all of the variation in attainment between these sectors, and others, through the introduction of school process constructs, selectivity indicators, and the social composition of schools, all of these measures may be mirroring certain aspects of this relationship

between schools and communities. Indeed, it is possible that the the particular value consistency that prevails between community and school is a necessary and enabling condition for their greater effectiveness.

The substantiation of such a theory of the relationship between communities and schools and its influence on the effectiveness of schools would seriously undermine the possibilities of improving the performance of lower attaining schools through the transfer of the practices found in the more effective schools. This study has found that instructionally related practices do account for a significant proportion of the systematic variation among schools, but without a more extensive analysis of data over a substantial period in the life of these schools it is not possible to disentangle the nature of the causal relationship between the various factors in the models. Indeed, the general framework of Newtonian causation that underlies the modelling strategies employed is in some respects incapable of encompassing the ontological structures that are implicit in the above theory of the relationship between communities and the effectiveness of schools.

The methodological framework of the present study has, however, furnished the basis for an advance on what was previously known about the structure and explanation of variation in effectiveness among Scottish schools. The multilevel modelling techniques developed in the last two to three years have provided a basis for explaining a substantial proportion of the systematic variation in attainment among schools. These methods allow the modelling of the relationships between schools and characteristics of their process and pupil intakes in a way that takes account of the variation at each level in the system. Ideally, this would include teaching groups and curriculum departments, in addition to the pupil-level, school-level, and sector-level variation that are modelled in the present study. However, neither the data nor the software were available for this more ambitious enterprise.

The two critical advances that multilevel models contribute to the modelling of school effectiveness are the representation of schools and groups among which the relationships between pupil background characteristics and attainment may vary (ie. variation in equity differentials), and the estimation of the component of the variation in school effectiveness (both in terms of equity and quality) that is systematic, and that which is random error. By definition only the systematic component of variation among schools is explainable, hence these models provide a more realistic basis for assessing the effects associated with the various factors that influence the effectiveness of schools. In this study it was found that between 80-90 percent of the variation in unadjusted mean attainment among schools was systematic variation, but that the systematic component of variation among schools dropped to 36-50 percent after adjusting these estimates of school mean attainment for the characteristics of pupils entering schools. As indicated earlier, the proportion of variance in pupil-level attainments that is associated with schools is between 3-11 percent, depending on the outcome considered and the type of pupil (disadvantaged, average, or advantaged) for which it is estimated. The interquartile range of variation in mean attainment among schools that is associated with this variance component was estimate to be of the order of two Ordinary Grade passes in terms of overall SCE attainment, for an average pupil. The full range of variation between the first and ninety-ninth percentile school in the system was estimated to be considerably greater; of the order of six or more Ordinary Grade passes for an average pupil.

This study should not be read as a definitive investigation of the effects of school process on pupil attainment. The measures of school process available represent a partial and inadequate coverage of the types of constructs that one would want to investigate in a full scale study of the effects of school process on variation in attainment among schools. The fact that this inadequate set of measures were by themselves successful in accounting for between one fifth and one third of the variation in

attainment among schools suggests that process characteristics have much greater potential to explain variation in effectiveness than has been believed to be the case hitherto.

In conjunction with the measures of the selectivity of school intakes and of the mean social class of schools, the school process constructs explained 70 percent of the variation in attainment in overall SCE attainment among schools, and between 40-50 percent of the variation in Ordinary Grade attainment in fourth year English and arithmetic. Further, the various models were successful in explaining most of the variation associated with school sectors.

Half of the one Ordinary Grade advantage that is associated with the Catholic sector after taking account of both the individual and aggregate characteristics of pupil intakes to schools is associated with the more favourable school processes in the schools in this sector. Further, half of the one Ordinary Grade advantage associated with schools established during the nineteenth century, the Victorian schools, and the disadvantage of a similar magnitude associated with modern schools is explained by the variation in school processes between these sectors. The inclusion of the mean social class of schools in the model reduced these sector effects to statistical non-significance. These findings were for models which initially assigned priority to the sector indicators, that is, sector membership was entered into the model before measures of school process. In a subsequent model which reversed this procedure and assigned causal priority to the school process constructs the effects associated with the Victorian schools were fully accounted for by the school process constructs in the model. Further, the only denominational sector effect to make an independent contribution to the explanation of mean attainment once the process characteristics had been taken into account, was that associated with modern non-denominational schools. This sector was found to have a mean level of attainment that is about one Ordinary Grade below the mean level prevailing in all other sectors combined. These

findings suggest that there is no independent Catholic schooling effect, nor is there one associated with the Victorian schools. Thus, the only sector effect that is not explained by the variation in school process, selectivity of school intakes, and the mean social class of school intakes is that for the modern non-denominational schools. The mean attainment of schools in this sector is uniformly about 10 percent of a standard deviation below that of all other sectors, for all three outcomes considered. This amounts to about one Ordinary Grade pass in terms of overall SCE attainment, and about one grade difference for each of the single subject outcomes.

The above findings do not mean that there are no differences in attainment among the sectors studied. As indicated earlier there are differences in attainment associated with Catholic schools, and with the Victorian schools, but these differences can be explained by the variation in selectivity of the intakes to schools, the mean social class of schools, and by variation in their school processes.

The school process constructs employed in the modelling of variation in attainment among schools were divided into two sets: Instructional factors, and the Influence of significant others. Among the instructional set, the most consistent influence across models and outcomes was for the constructs for *teaching methods*, *good teacher*, and *truant S2-S4*. The three constructs indicating that *schoolwork was encouraged by teachers*, *parental support for staying on after fourth year*, and that *peers took school seriously*, were influential determinants of the variation in mean attainment among the second set. In general the first set of factors was more resistant to the introduction into the model of the indicators for the selectivity and the mean social class of school intakes, and for sectors. About one third of the variation associated with the constructs for Instructional factors was jointly explainable by these latter factors. The constructs for the Influence of significant others shared a larger proportion of their effects jointly with the other

factors in the models. That is, their unique contribution was less than that for the first set of factors once the selectivity and mean social class of school intakes and sector indicators were also taken into account in the model.

These findings suggest that a substantial improvement in the performance of some schools could be obtained from the transfer of more effective practices to these schools, provided, of course, that the influence of school process can be disengaged from that associated with other factors in these models. The model was unable to explain a substantial proportion of the variation associated with the modern non-denominational sector, and priority should also be given to investigating the source of the low performance of this sector. There are some indications in the findings that part of the explanation for this difference be associated with city schools in areas of social deprivation, however, this remains little more than a conjecture at present. Although Garner (1987) found that measures of deprivation made a statistically significant contribution to the explanation of pupil-level attainment, the magnitude of the effect was small and may be encompassed by the measure of school mean social class employed in the present analyses. The measures of school process employed in the present study are, however, inadequate for the purposes of determining which instructionally related practices have the greatest effects. The measures underlying the constructs represent only a small proportion of the items that would constitute an adequate study of effective practices, and the findings would need replicating before one could have confidence that they merit the attention and detailed elaboration that would be required to translate them into appropriate modifications to current policy and practice.

Implications for further research

As indicated above, the main findings of this study relate to the power of the school process constructs to explain variation among educational sectors, and among schools. The measures of

selectivity included in the models appear to be fairly efficient at controlling for the effects of formal and informal selection. In many instances the models are able to account for all of the differential in attainment between formally selective and non-selective schools, and between creamed and uncreamed schools. Thus, there is no justification for restricting future research to any particular subset of schools that are assumed to be free of the effects of selection. The methodology employed in the present study is capable of modelling the effects of selectivity and results in a richer description of the variation among schools in the system.

Further, the investigation of process characteristics in the Catholic and Victorian schools is likely to provide the most fertile ground for the location of effective practices. However, their salience is only likely to become evident if they are juxtaposed with the practices observed in schools with average and inferior process environments. In addition, it would be a serious mistake to assume that all Catholic or Victorian schools exhibit effective practices: there is a considerable degree of overlap in the within-sector distributions across sectors, hence there are, for example, schools in the lowest attaining sector which have more effective process environments than many of the schools in the higher attaining sectors.

As reiterated more than once above, the school process effects found in this study should only be treated as indicative of the power of process constructs to explain the variation in effectiveness among schools. A first priority in developing the potential of the present research would be to establish a more adequate investigation of the school processes that influence the effectiveness of schools. Many of the items available to the present study, such as those associated with the pastoral function of schools, were found to have only a very weak relationship to school mean attainment, which points to the payoff that may accrue from investment in the development of a more adequate theoretical model of the way that schools work.

Such a model should start from the basis of the recent findings in the literature that the curriculum is an essential component of the organisational framework through which processes have their effects. The conceptualisation of schools as multi-layered differentiated organisations provides the essential exoskeleton for such a theory. The recent DES report that half of the teaching in comprehensive schools in England and Wales is in mixed ability classes comes as a surprise to educational administrators, as they had expected the proportion to be considerably higher (Wilby, 1987). The extent and form of grouping has not been assessed in Scotland, but research in the United States[1] suggests that the variation in this practice is likely to be related to variation in pupil attainment. In general, the research has shown that more homogeneous teaching groups have higher levels of attainment.

The literature on effective schooling suggests that other factors that influence attainment include, management, effectiveness in the use of time, high morale and commitment, clear goals, consistency in the application of rewards and punishment, disciplinary climate, and an emphasis on academically oriented achievements.

Although school effectiveness research has failed to adequately investigate the effects of methods of instruction, save a rather uninspiring acceptance of what is referred to as direct instruction, several promising approaches have emerged in the instructional effects literature: mastery learning, co-operative and team learning, and peer tutoring, in particular. These along with the creative use of computer assisted techniques to augment certain instructional practices should be the basis of renewed interest in raising the level of attainment of all pupils. The change of climate in the 1980s has lead to a de-emphasising of the importance of developing effective

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[1] Dreeben and Barr, 1987: Barr and Dreeben, 1983; and others. See chapters 2 and 7.

instructional practices. Instead, administrators and researchers have turned to the policy issues of the moment: falling rolls, cost efficiency, the monitoring of standards, the collapse of the youth labour market. The widescale experimentation that was associated with the introduction of such innovations as mixed ability teaching, and open classrooms, in the previous decade have been paralleled only by the introduction of computers into the classroom in the present decade. As yet there appear to be no emergent plans for innovation in instructional practices in the 1990s. This is not to belittle or detract from the reforms associated with the introduction of the Standard Grade and the Action Plan, but rather, to point to the lack of activity in the particular area of developing and enhancing instructional practices, which are at the critical nexus between teaching and learning.

Research on the effectiveness of schooling has benefited greatly from the recent statistical advances in the modelling of multi-level data. The data on pupil attainment is the carrier of information on the effects of schools, educational sectors, and the social background of pupils. These newly developed methods advance our ability to disentangle these different sets of influences, although their final utility is dependent upon the adequacy of our conceptual models of the processes under study. The findings from the present study would almost certainly not have emerged from the previously extant statistical methods. However, there is a need to integrate the use of these methods with others of a more ethnographic or observational nature.

A future programme of research into the influence of school process on the effectiveness of schools will need to simultaneously focus on a wide range of schools in order to investigate variation associated with sectors and other structural aspects of the school system, and on intensive studies of selected schools. The most significant change in methodological orientation in school effectiveness research over the last decade has been its shift away from large scale

quantitative studies to case studies of individual schools, or small groups of schools. The discussion of the problems of generalizing from small unrepresentative samples of schools to schools in general were elaborated earlier in this work, and the probity of generalizations from these studies has been the subject of trenchant critiques in the literature.

Implications for the Government's proposed educational reforms

This section discusses the government's proposed reforms to secondary schooling in the context of their influence on the effectiveness of schooling. As with most large scale reforms the essential motivation and objectives for the present reforms are political . There is nothing inherently wrong with this situation, indeed it is the *sine qua non* of the development and implementation of *policy*. The motivation and objectives of the comprehensive reforms of the 1960s were of the same character, in that their focus was on the abolition of selection, and that all pupils should be educated in the one type of school. These objectives were not directly related to pupil learning, but ,rather at the social organisation of schooling. In a similar vein, the present objectives are not aimed primarily at pupil learning, but at the administrative control of schooling.

The Government has issued five consultative papers related to its proposed reforms. These outline the separate but linked proposals for: the delegation of greater financial responsibility to schools, the conditions for the admission of pupils to maintained schools, the conditions under which public schools may elect to become Grant Maintained, and the national curriculum and assessment thereof.

This discussion of these proposal will focus on the effects they are likely to have on the effectiveness of schooling. The first proposal for the delegation of greater financial responsibility to schools is unlikely to have any direct impact on

the learning of pupils. Its indirect effects are also likely to be minimal. However, it does have particular implications for the administration of schools. Based on per capita expenditure estimates for 1986/87 the education of pupils in the average school costs somewhere in the region of £1000-£1500 per annum. Thus, the annual budget for a school of 1000 pupils is of the order of £1.0m-£1.5m pounds. More than half of this is taken up by staff costs: teachers, ancillary staff, and administration. The proposals indicate that LEAs will continue to provide certain central services such as: the provision of educational welfare, psychological, library, services, etc, the advisory and inspection services. In addition LEAs will retain responsibility for capital expenditure. Thus the funds that schools will be given discretionary control over are likely to be of the order of £200,000 or less. In addition, there are proposals for school governing bodies to be given control of staffing appointments. In many instances school governors and staff currently will not have the experience that will allow them to make efficient use of these funds, and the personnel and professional competencies required to make the best appointments. Hence, there is an urgent need for the provision of training in the professional skills that will be required. To fail to provide such training risks experiencing a situation similar to the near-collapse of the school system that was experienced in the Australian state of Victoria when similar measures were implemented without adequate professional backup a couple of years ago. If there is one lesson to be learnt from recent research on the implementation of innovation, it is that it rarely proceeds according to plan, and that the unintended consequences often thwart the attainment of the principal objectives. Hence, there is a need for a longer term advice and support facility for schools during the implementation phase and for some time after.

The proposals for the admission of pupils to maintained schools seek to provide wider access to LEA schools for pupils outwith their territorial catchment. That is, they are an extension of the current 'parents charter' leglislation. The

proposals appear to do little more than to codify the current practices. Their intent appears to be to compel LEAs which do not currently allow entry for pupils from outwith the catchment, entry for such pupils up to the 'standard number' of places that are indicated by the 'physical capacity' of a school.

The proposals for Grant Maintained schools set out the conditions under which schools that are currently under the control of LEAs may opt out and receive Grant Maintained status. The principal objective of this proposal is to devolve control of schools to locally elected governors and provide schools with greater independence from the policies of LEAs. Although, as we will see later, central government will take a much stronger degree of control over all schools through the introduction of a national curriculum and national assessment programme. Funding for these schools will be provided by subvention from the LEA, and per capita rates will be the same as in equivalent LEA schools. Linked with the above proposals to devolve greater financial responsibilities to schools, these proposals will provide schools with a substantial degree of autonomy over their affairs. Such systems are in operation in other countries, Denmark notably, where they have worked successfully for many years. However, the Danish system provides rather greater opportunity for a co-operative partnership between teachers, parents, and pupils, than that envisaged under the present proposals. It also offers far greater flexibility in the establishment of schools, with the state providing funds for interested partnerships of teachers and parents to establish their own schools.

These proposals to allow schools to opt out from LEA control will have no direct bearing on general levels of attainment. Although, the attainment of pupils in these schools may increase, this is likely to be the result of informal selection processes that relate to the choice of schools by parents. There is nothing in this proposal that has a direct impact on the instructional skills of teachers or the learning of pupils, and the proposals fall

far short of the comprehensive reforms that would be required to create a new partnership between parents, teachers, and pupils.

Finally, the proposals for a national curriculum and assessment system provide the most important of the reforms. The aims of this reform are to raise standards. Four reasons for why a national curriculum and assessment system would raise standards are offered:

(1) they would ensure that all pupils study a broad and balanced range of subjects through their compulsory schooling and do not drop out too early from studies which may stand them in good stead later.

(2) by setting clear objectives for what children over the full range of ability should be able to achieve , which the pupils themselves and their teachers, supported by parents and others, can work towards with confidence. This would supposedly resolve a weakness of the present system in which the under-expectation of teachers of what their pupils are capable of results in low attainment,

(3) by offering a uniform curriculum so that pupils in different LEAs, and pupils from different ethnic backgrounds, etc, would all study similar programmes,

(4) it would provide checks on the progress of pupils and levels of performance at various stages.

The literature on the effectiveness of schooling supports the contention that the monitoring of pupil progress, and the setting of clear objectives are essential elements of effective schooling. But the proposals indicate that this monitoring will be undertaken at the ages of 7, 11, and 14 years, which is of little use to the classroom teacher. By the time a pupil is assessed again they will have moved on to the next phase of schooling, where they will have a different teacher. In the school effectiveness literature, *monitoring* refers to the assessment of pupil mastery of curriculum material at the end of each *unit* of learning, not at

the end of each *stage* of schooling. What information is there in the data on progress between the ages of 7 and 11 years for a pupil entrant to a standard six class? The advantage to the teacher in having access to such data lies in its diagnostic value. But the proposed testing programme is principally a test of attainment, of the pupil's acquisition of the skills and knowledge embodied in the prescribed curricular materials. This is not diagnostic testing, which would require much more sensitive and complex tests than those that measure attainment. For teachers, the only information in the attainment tests is an indication of the pupil's level of attainment at the age at which the test was taken. This may help teachers to pitch their instruction at a particular level, but the level at which instruction is pitched and the pace at which it proceeds is governed more by the compositional characteristics of the whole class, than by the *individual differences* of pupils.

While the school effectiveness literature also supports the idea that high teacher expectations influence pupil attainment, these are most effective when they are embodied in the *professional* approach of teachers to their work. Providing national guidelines for the expected progress of pupils over four-year periods is not likely to prove effective in achieving this objective.

Pupils vary by a substantial degree in their attainment growth rates over time. Some of this variation is due to individual patterns of variation in development, while some is due to the circumstances of a child's life. A wide range of non-school, family, and social factors are responsible for much more of the variation in pupil attainment than that associated with schools. Thus, it is is not unusual to find pupils who are attaining at, say, the twenty-fifth percentile of their age-group distribution at one age, to be attaining at the thirty-fifth percentile at a later age, or vice versa. This markedly reduces the viability of setting realistic targets for pupils at all ability levels for individual pupils Such targets may be set for groups

of pupils much more validly, since the few who will deviate in either direction from an overall mean will balance out. Indeed, this is the principal that makes the proposal to use the assessment results for accountability purposes workable.

The main benefit of the proposals, and perhaps their main agenda, is to provide the public with information on the attainment of pupils in schools. That is, the main impact of the legislation will be in the domain of the accountability of schools. This links directly with the governments aims to facilitate parental control over the choice of schools for their children.

However, the assessment of the performance of schools cannot be undertaken validly through the mere publication of pupil results on attainment tests. The only way that schools can be compared fairly is to take account of the nature of their intakes in assessing the attainment of pupils. The fact that a school in a middle class area achieves an average pupil test score of 70 while that in a depressed inner city area achieves an average pupil score of 30 tells one absolutely nothing about the relative effectiveness of the two schools. The lower attaining school may be increasing its pupils scores by 10 percentage points while the higher attaining school may be increasing its pupils attainment levels by only 5 percentage points. There is nothing in data on the unadjusted attainment levels of pupils that addresses the question of the effectiveness of schools. There is ample research which can point to individual schools with lower average levels of attainment that are far more effective than schools with higher levels of attainment. This is true even of differences between educational sectors. For example, this study has shown that the Catholic schools in Scotland have lower levels of unadjusted attainment than the non-denominational schools, but after taking account of the social background of pupils in the two sectors, the Catholic schools are found to have the higher levels of attainment. The unadjusted measures of attainment, that is, average pupil scores, indicate a level of attainment in learning the curriculum material. But they do not indicate anything about

the progress that pupils have made in a particular school, that is, they are not indicators of the effectiveness of schools.

Adjusting the attainment of pupils to take account of the initial starting point is a complex statistical operation. As indicated by their application in this study, there has been major progress in developing the appropriate statistical methods over the last couple of years, but a great deal needs to be done before they could be disseminated to LEAs and schools in a form that makes them comprehensible, and of utility to those responsible for administering schools.

Finally, the unintended consequences of the introduction of a national curriculum and assessment system can be gauged from the effects of minimum competency testing in the United States, although the assessment regime proposed should probably be called a maximum competency test. Madaus (1981) has identified a cycle that accompanies the introduction of such testing, which incidently is not new, as it has been in widespread use at different times, and in various forms, in European and North American school systems for over a century. The cycle of events that Madaus identifies is first that an assessment test is put in place in response to demands to do something about the low standard of educational attainment, the tests then become an administrative device to ensure accountability, before they eventually come under attack for the negative impact that they are having on teaching and learning, and eventually their use as indicators of pupil competencies and attainment is abandoned in favour of teacher judgements.

The major unintended effects are usually those associated with the narrowing of the curriculum. However, in the present proposals this is an intended consequence. Over a century ago, Mathew Arnold, who was at the time an inspector of schools described the results of tests of pupil attainment that regulated the accountability of teachers as:

> ..... a game of contrivance in which teachers will and must learn how to beat us. It is found possible by ingenious preparation, to get children through the .... examination in reading, writing and ciphering, without their really knowing how to read, write and cipher (Sutherland, 1973, pp52).

It is the dual use of such tests as indicators of pupil progress or competencies and their use as instruments of accountability that leads to this negative effect. Testing *per se* does not impair or distort pupil learning and progress, indeed as the school effectiveness literature shows, it is an essential component of effective learning programmes. An alternative to the proposed regime of testing, which incidently, also imposes accountability on the pupil, would be the introduction of a system of professional development to continually raise and regenerate the professional teaching skills and knowledge of teachers. If teachers had the same professional standing as doctors and solicitors, there would likely be much less cause for complaint about standards. Teachers would be supported and encouraged to participate in and keep abreast of the latest developments in instructional methods and teaching techniques. The necessary supporting structures for developing a highly professional teaching force simply do not exist at present.

In conclusion, the proposed reforms are unlikely to make a major impact on the levels of knowledge and skills that pupils attain. They place only secondary emphasis on the necessary ingredients of a programme that would make schools more effective, and many of these aspects of the proposals will prove inadequate for the task. They totally neglect the critical elements of the teaching and learning process - instructional skills and methods, and the process of learning. Part of the reason for this is, no doubt, the paucity of research and development in this area that has been funded in the recent past. There are promising developments on the horizon, but few of them are home grown, and the emphasis on locating effective practices

in the present school system that has dominated other educational systems over the last decade has gone almost unrecognised in the country. If we want guidelines for effective schools in the UK where do we look beyond the handful of research studies that have been conducted ? To the United States, where there has been a wide ranging programme of research and development in the area of locating effective schooling practices, and in the implementation of school improvement programmes. The Secretary of State's recent visit there is evidence that those framing these proposals know of more effective ways of improving schools than those included in the proposals they have recently published. The thinking in the US has moved on to a new phase which emphasises how pupils learn and how teachers teach (Duffy, 1987), rather than the 'back to basics' and emphasis on charismatic instructional leaders that featured so strongly in thinking earlier in the decade (Cuttance, 1986).

> ...if we really wanted to see how to make comprehensives work, we would be looking at them, discovering how best to replicate their achievements. That would make sound educational sense." (Michael Duffy, Head of King Edward VI Comprehensive, Morpeth, 1987)

Appendix A

Frequencies of Pupil-Level School Process Items Before Aggregation into School-Level Process Measures

Variable group: CLASSRM1 to CLASSRM8

"Here are some things people have said about school lessons. Think about your English lessons in fourth year. Which of the following is true ?"

Pupil-level: 1 = true; 2 = untrue

School-level: Percent within school with response value 1.

CLASSRM1 "the teacher started lessons on time"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	3001	13.0	56.8	56.8
	2	2278	9.8	43.2	100.0
	.	1	.0	MISSING	
	97	26	.1	MISSING	
	99	17853	77.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5279 MISSING CASES 17880

CLASSRM2 "we nearly always had the proper teacher"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	0	1	.0	.0	.0
	1	4740	20.5	89.9	89.9
	2	534	2.3	10.1	100.0
	.	1	.0	MISSING	
	97	26	.1	MISSING	
	99	17857	77.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5275 MISSING CASES 17884

CLASSRM3 "the teacher knew our names"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	4991	21.6	94.6	94.6
	2	286	1.2	5.4	100.0
	.	1	.0	MISSING	
	97	26	.1	MISSING	
	99	17855	77.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5277 MISSING CASES 17882

CLASSRM4 "there were enough books and materials to go around"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	0	1	.0	.0	.0
	1	3374	14.6	64.0	64.0
	2	1899	8.2	36.0	100.0
	.	1	.0	MISSING	
	97	26	.1	MISSING	
	99	17858	77.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5274 MISSING CASES 17885

CLASSRM5 "the teacher marked our work regularly"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	3744	16.2	71.0	71.0
	2	1530	6.6	29.0	100.0
	.	1	.0	MISSING	
	97	26	.1	MISSING	
	99	17858	77.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5274 MISSING CASES 17885

CLASSRM6 "the teacher could keep order in class"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	0	1	.0	.0	.0
	1	3690	15.9	70.2	70.2
	2	1569	6.8	29.8	100.0
	.	1	.0	MISSING	
	97	26	.1	MISSING	
	99	17872	77.2	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5260 MISSING CASES 17899

CLASSRM7 "we were regularly given homework"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	3204	13.8	60.6	60.6
	2	2080	9.0	39.4	100.0
	.	1	.0	MISSING	
	97	26	.1	MISSING	
	99	17848	77.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5284 MISSING CASES 17875

CLASSRM8 "the teacher made sure that we did any homework that was set"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	0	1	.0	.0	.0
	1	3346	14.4	61.7	61.8
	2	2072	8.9	38.2	100.0
	.	1	.0	MISSING	
	97	26	.1	MISSING	
	99	17713	76.5	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5419 MISSING CASES 17740

TREAT "How well did your school treat you during your last year ?"

Pupil-level: 1 = well enough for someone my age; 2 = fairly well; 3 = too much as a child.

School-level: Percent within school with response value 1

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	1922	8.3	36.4	36.4
	2	2729	11.8	51.7	88.1
	3	627	2.7	11.9	100.0
	98	1	.0	.0	100.0
	.	1	.0	MISSING	
	99	17879	77.2	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5279 MISSING CASES 17880

TRUANT "Did you ever truant in your fourth year at school ?"

Pupil-level: 1 = never; 2 = a lesson here and there; 3 = a day here and there; 4 = several days at a time; 5 = weeks at a time.

School-level: Percentage within school with response value 1.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	0	1	.0	.0	.0
	1	4977	21.5	44.4	44.4
	2	3399	14.7	30.3	74.7
	3	2145	9.3	19.1	93.9
	4	445	1.9	4.0	97.8
	5	241	1.0	2.2	100.0
	.	1	.0	MISSING	
	98	5652	24.4	MISSING	
	99	6298	27.2	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 11208 MISSING CASES 11951

BELT "Did you ever get the belt or strap at secondary school ?"

Pupil-level: 1 = never; 2 = once or twice; 3 = quite often; 4 = often.

School-level: Percentage within school with response value 1.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	3905	16.9	34.7	34.7
	2	5212	22.5	46.3	81.1
	3	1448	6.3	12.9	94.0
	4	680	2.9	6.0	100.0
	.	1	.0	MISSING	
	98	11842	51.1	MISSING	
	99	71	.3	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 11245 MISSING CASES 11914

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FOURTHOK "On the whole do you feel that your fourth year at school was worthwhile ?"

Pupil-level: 1 = yes; 2 = no.

School-level: Percentage within school with response value 1.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	6300	27.2	78.7	78.7
	2	1702	7.3	21.3	100.0
	.	1	.0	MISSING	
	98	6859	29.6	MISSING	
	99	8297	35.8	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 8002 MISSING CASES 15157

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Variable group: GUIDOPT to GUIDPERS
"Did your teachers give you enough help with ?"

Pupil-level: 1 = yes; 2 = no; 3 = I did'nt want help.

School-level: Percentage within school with response value ≠ 2.

GUIDOPT "choosing subjects at end of second year"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	1865	8.1	34.5	34.5
NO	2	2218	9.6	41.1	75.6
I DIDN'T WANT HELP	3	1316	5.7	24.4	100.0
	.	1	.0	MISSING	
NONE OF GROUP ANSWRD	97	1066	4.6	MISSING	
NOT ANSWERED	99	16693	72.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5399 MISSING CASES 17760

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GUIDWORK "your schoolwork"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	2198	9.5	41.0	41.0
NO	2	1236	5.3	23.1	64.0
I DIDN'T WANT HELP	3	1928	8.3	36.0	100.0
	.	1	.0	MISSING	
NONE OF GROUP ANSWRD	97	1066	4.6	MISSING	
NOT ANSWERED	99	16730	72.2	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5362 MISSING CASES 17797

GUIDJOB "learning about jobs and careers"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	1783	7.7	33.1	33.1
NO	2	2790	12.0	51.8	84.9
I DIDN'T WANT HELP	3	812	3.5	15.1	100.0
	.	1	.0	MISSING	
NONE OF GROUP ANSWRD	97	1066	4.6	MISSING	
NOT ANSWERED	99	16707	72.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5385 MISSING CASES 17774

GUIDPERS "your own personal problems"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	1792	7.7	33.5	33.5
NO	2	1893	8.2	35.4	69.0
I DIDN'T WANT HELP	3	1658	7.2	31.0	100.0
	.	1	.0	MISSING	
NONE OF GROUP ANSWRD	97	1066	4.6	MISSING	
NOT ANSWERED	99	16749	72.3	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5343 MISSING CASES 17816

- -

Variable group: **S4FEEL1 to S4FEEL8**

"Here are some things that people have said about their fourth year at school. We want to know what you think about fourth year. (Try to give an 'on balance' opinion)

Pupil-level: 1 = true; 2 = untrue.

School-level: S4FEEL1, S4FEEL4, S4FEEL5, S4FEEL7 - Percentage within school with response value 1. S4FEEL2, S4FEEL3, S4FEEL6, S4FEEL8 - Percentage within school with response value 2.

S4FEEL1 "school work was worth doing"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	5132	22.2	84.7	84.7
	2	926	4.0	15.3	100.0
	.	1	.0	MISSING	
	97	41	.2	MISSING	
	99	17059	73.7	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 6058 MISSING CASES 17101

- -

S4FEEL2 "my teachers didn't care about me"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	832	3.6	13.8	13.8
	2	5181	22.4	86.2	100.0
	.	1	.0	MISSING	
	97	41	.2	MISSING	
	99	17104	73.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 6013 MISSING CASES 17146

- -

S4FEEL3 "there were too many troublemakers in my classes"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	1884	8.1	31.2	31.2
	2	4162	18.0	68.8	100.0
	.	1	.0	MISSING	
	97	41	.2	MISSING	
	99	17071	73.7	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 6046 MISSING CASES 17113

S4FEEL4 "my teachers helped me to do my best"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	4446	19.2	74.1	74.1
	2	1556	6.7	25.9	100.0
	.	1	.0	MISSING	
	97	41	.2	MISSING	
	99	17115	73.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 6002 MISSING CASES 17157

S4FEEL5 "I had plenty of friends to be with at school"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	5787	25.0	95.0	95.0
	2	305	1.3	5.0	100.0
	.	1	.0	*~ &ING	
	97	41	.2	MISSING	
	99	17025	73.5	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 6092 MISSING CASES 17067

S4FEEL6 "teachers were always picking on me"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	410	1.8	6.8	6.8
	2	5625	24.3	93.2	100.0
	.	1	.0	MISSING	
	97	41	.2	MISSING	
	99	17082	73.8	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 6035 MISSING CASES 17124

S4FEEL7 "my friends took school seriously"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	2963	12.8	49.7	49.7
	2	2993	12.9	50.3	100.0
	.	1	.0	MISSING	
	97	41	.2	MISSING	
	99	17161	74.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5956 MISSING CASES 17203

S4FEEL8 "school was a waste of time for me"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	942	4.1	15.5	15.5
	2	5117	22.1	84.5	100.0
	.	1	.0	MISSING	
	97	41	.2	MISSING	
	99	17058	73.7	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 6059 MISSING CASES 17100

Variable group: TEACHKN1 to TEACHKN4

"In your last year at school, did any of your teachers know you well enough to give you useful advice about.."

Pupil-level: 1 = yes; 2 = no.

School-level: Percentage within school with response value 1.

TEACHKN1 "education and/or training after leaving school ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	2756	11.9	59.6	59.6
	2	1866	8.1	40.4	100.0
	.	1	.0	MISSING	
	97	29	.1	MISSING	
	98	5827	25.2	MISSING	
	99	12680	54.8	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4622 MISSING CASES 18537

TEACHKN2 "your future job ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	2125	9.2	46.5	46.5
	2	2449	10.6	53.5	100.0
	.	1	.0	MISSING	
	97	29	.1	MISSING	
	98	5827	25.2	MISSING	
	99	12728	55.0	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4574 MISSING CASES 18585

TEACHKN3 "how you could improve your performance in the subjects they taught ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	2806	12.1	61.3	61.3
	2	1772	7.7	38.7	100.0
	.	1	.0	MISSING	
	97	29	.1	MISSING	
	98	5827	25.2	MISSING	
	99	12724	54.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4578 MISSING CASES 18581

TEACHKN4 "personal matters ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	939	4.1	21.1	21.1
	2	3517	15.2	78.9	100.0
	.	1	.0	MISSING	
	97	29	.1	MISSING	
	98	5827	25.2	MISSING	
	99	12846	55.5	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4456 MISSING CASES 18703

- -

Variable group: **TRUANTPR TO TRUANTS3**

"Did you sometimes play truant .."

Pupil-level: 1 = yes; 2 = no.

School-level: Percentage within school with response value 2.

TRUANTPR "in primary school ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	263	1.1	5.3	5.3
NO	2	4706	20.3	94.7	100.0
	.	1	.0	MISSING	
NONE OF GROUP ANSWRD	97	111	.5	MISSING	
NOT ANSWERED	99	18078	78.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4969 MISSING CASES 18190

- -

TRUANTS1 "in first year at secondary school ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	562	2.4	11.4	11.4
NO	2	4355	18.8	88.6	100.0
	.	1	.0	MISSING	
NONE OF GROUP ANSWRD	97	111	.5	MISSING	
NOT ANSWERED	99	18130	78.3	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4917 MISSING CASES 18242

- -

TRUANTS2 "in second year at secondary school ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	949	4.1	19.0	19.0
NO	2	4039	17.4	81.0	100.0
	.	1	.0	MISSING	
NONE OF GROUP ANSWRD	97	111	.5	MISSING	
NOT ANSWERED	99	18059	78.0	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4988 MISSING CASES 18171

- -

TRUANTS3 "in third year at secondary school ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	1756	7.6	34.0	34.0
NO	2	3408	14.7	66.0	100.0
	.	1	.0	MISSING	
NONE OF GROUP ANSWRD	97	111	.5	MISSING	
NOT ANSWERED	99	17883	77.2	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5164 MISSING CASES 17995

Variable group: **S4S5PARY to S4S5PARN**

"When you were in fourth year at school.."

Pupil-level: 1 = yes; 2 = no.

School-level: S4S5PARY, S4S5TCHY - Percentage within school with response value 1. S4S5TCHN, S4S5PARN, S4S5JOB - Percentage within school with response value 2.

S4S5PARY "did your parents want you to stay on for another year ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1.	3568	15.4	60.8	60.8
	2	2296	9.9	39.2	100.0
	.	1	.0	MISSING	
	97	36	.2	MISSING	
	99	17258	74.5	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5864 MISSING CASES 17295

S4S5TCHN "did any of your teachers advise you to leave ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	458	2.0	7.9	7.9
	2	5311	22.9	92.1	100.0
	.	1	.0	MISSING	
	97	36	.2	MISSING	
	99	17353	74.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5769 MISSING CASES 17390

S4S5JOB "were you seriously looking for a job ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	3045	13.1	51.6	51.6
	2	2853	12.3	48.4	100.0
	.	1	.0	MISSING	
	97	36	.2	MISSING	
	99	17224	74.4	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5898 MISSING CASES 17261

S4S5TCHY "did any of your teachers want you to stay on ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	3274	14.1	57.4	57.4
	2	2429	10.5	42.6	100.0
	.	1	.0	MISSING	
	97	36	.2	MISSING	
	99	17419	75.2	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5703 MISSING CASES 17456

S4S5PARN "did your parents want you to leave ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	1833	7.9	32.4	32.4
	2	3822	16.5	67.6	100.0
	.	1	.0	MISSING	
	97	36	.2	MISSING	
	99	17467	75.4	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 5655 MISSING CASES 17504

- -

Variable group: **TEACHLP5 to TEACHLP8**

"At the last school you went to, how much did your teachers help you .."

Pupil-level: 1 = a lot; 2 = quite a lot; 3 = not very much; 4 = not at all.

School-level: Percentage within school with response value 1 or 2.

TEACHLP5 "to learn things which would be useful to you in a job"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	528	2.3	23.1	23.1
	2	1194	5.2	52.2	75.3
	3	452	2.0	19.8	95.0
	4	114	.5	5.0	100.0
	.	1	.0	MISSING	
	98	2132	9.2	MISSING	
	99	18738	80.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 2288 MISSING CASES 20871

- -

TEACHLP6 "to have spare time interests and hobbies"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	508	2.2	22.2	22.2
	2	938	4.1	40.9	63.1
	3	624	2.7	27.2	90.4
	4	221	1.0	9.6	100.0
	.	1	.0	MISSING	
	98	2132	9.2	MISSING	
	99	18735	80.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 2291 MISSING CASES 20868

- -

TEACHLP7 "to learn how to get on with other people"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	652	2.8	28.6	28.6
	2	968	4.2	42.4	71.0
	3	535	2.3	23.4	94.4
	4	128	.6	5.6	100.0
	.	1	.0	MISSING	
	98	2132	9.2	MISSING	
	99	18743	80.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 2283 MISSING CASES 20876

TEACHLP8 "to have confidence and self-respect"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	586	2.5	25.7	25.7
	2	850	3.7	37.2	62.9
	3	641	2.8	28.1	90.9
	4	207	.9	9.1	100.0
	,	1	.0	MISSING	
	98	2132	9.2	MISSING	
	99	18742	80.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 2284 MISSING CASES 20875

- -

Variable group: EXTRATC1 to EXTRATC4

"In your fourth year at school did you have any extra teaching, outwith school hours, from .."

Pupil-level: 1 = yes; 2 = no.

School-level: Percentage within school with response value 1.

EXTRATC1 "any of the teachers at your school"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	305	1.3	7.2	7.2
	2	3950	17.1	92.8	100.0
	.	1	.0	MISSING	
	99	18903	81.6	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4255 MISSING CASES 18904

- -

EXTRATC2 "one of your family"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1.	305	1.3	7.5	7.5
	2	3768	16.3	92.5	100.0
	.	1	.0	MISSING	
	99	19085	82.4	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4073 MISSING CASES 19086

- -

EXTRATC3 "a paid tutor"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	159	.7	3.9	3.9
	2	3919	16.9	96.1	100.0
	.	1	.0	MISSING	
	99	19080	82.4	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4078 MISSING CASES 19081

- -

EXTRATC4 "someone else"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	78	.3	1.9	1.9
	2	3953	17.1	98.1	100.0
	.	1	.0	MISSING	
	99	19127	82.6	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4031 MISSING CASES 19128

Variable group: HMWKHRS1 to HMWKHRS2

"In your fourth year at school how much time did you usually spend doing homework.."

Pupil-level: 1 = none; 2 = less than one hour; 3 =one hour or more.

School-level: Percentage within school with response value 3.

HMWKHRS1 "on a week day ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	569	2.5	12.8	12.8
	2	2022	8.7	45.7	58.5
	3	1838	7.9	41.5	100.0
	.	1	.0	MISSING	
	99	18729	80.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4429 MISSING CASES 18730

HMWKHRS2 "at a weekend ?"

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	1246	5.4	30.1	30.1
	2	1166	5.0	28.2	58.3
	3	1723	7.4	41.7	100.0
	.	1	.0	MISSING	
	99	19023	82.1	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4135 MISSING CASES 19024

- -

HMWKPLCE "If you had homework, where did you usually do it ?"

Pupil-level: 1 = mostly at school; 2 = mostly at home, away from other people; 3 = mostly at home, with other people around; 4 = on a bus/train; 5 = at a friends house; 6 = with other family, eg. Granny's; 7 = at the library, or other non-home, non-school setting; 8 = non-specific, eg. anywhere; 9 = never did it.

School-level: Percentage within school with response value 1 or 2.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	898	3.9	20.7	20.7
	2	2552	11.0	58.8	79.4
	3	868	3.7	20.0	99.4
	4	25	.1	.6	100.0
	.	1	.0	MISSING	
	99	18815	81.2	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4343 MISSING CASES 18816

- -

HMWKSET "And how much homework did most of your teachers expect you to do ?"

Pupil-level: 1 = about what I did; 2 = more than I did; 3 = I was not expected to do any.

School-level: Percentage within school with response value 2.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	2251	9.7	50.1	50.1
	2	1987	8.6	44.2	94.3
	3	254	1.1	5.7	100.0
	.	1	.0	MISSING	
	99	18666	80.6	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4492 MISSING CASES 18667

- -

- -

HOMETEXT "Were you allowed to take home with you text-books belonging to the school ?"

Pupil-level: 1 = yes, for all subjects; 2 = yes, for some subjects; 3 = no, not at all.

School-level: Percentage within school with response value 1.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	2366	10.2	52.4	52.4
	2	2075	9.0	46.0	98.4
	3	71	.3	1.6	100.0
	.	1	.0	MISSING	
	99	18646	80.5	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4512 MISSING CASES 18647

- -

ENJOY "On the whole, would you say you enjoyed your last year at school ?"

Pupil-level: 1 = yes; 2 = no.

School-level: Percentage within school with response value 1.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	3118	13.5	69.2	69.2
	2	1386	6.0	30.8	100.0
	.	1	.0	MISSING	
	98	2388	10.3	MISSING	
	99	16266	70.2	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4504 MISSING CASES 18655

- -

ENJOY4TH "On the whole, would you say you enjoyed your fourth year at school ?"

Pupil-level: 1 = yes; 2 = no.

School-level: Percentage within school with response value 1.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1	3931	17.0	85.0	85.0
	2	691	3.0	15.0	100.0
	.	1	.0	MISSING	
	98	6061	26.2	MISSING	
	99	12475	53.9	MISSING	
	TOTAL	23159	100.0	100.0	

VALID CASES 4622 MISSING CASES 18537

Appendix B

Note on reading boxplots

The grouped box plot display is a means of comparing the main characteristics of several distributions in a single display.

(1) The median (50th percentile) of each plot is marked by a + sign, and/or a bar across the plot.

(2) The lower and upper limits of the central box represent the 25th and the 75th percentiles of the distribution (interquartile range), respectively. These points are referred to as the lower and upper *hinges* of the boxplot. The distance between the lower and upper hinges is thus the interquartile range for the data depicted by the boxplot.

(3) The tails of a distribution are represented by the 'whiskers', and extreme points (outliers) are represented by a special symbol (one of the following *, '0' (zero), |), depending upon the software employed to generate the graphics for the particular analysis.

The length of the whiskers is determined by computing: hinge ± 1.5 x (interquartile range). Otherwise the whisker terminates at the largest/smallest value in the distribution. The more extreme points are denoted by special symbols, usually an asterisk. The various points in a boxplot will only be symmetric about the median when the data on which they are based is also symmetric. In particular, the boxplots for skewed distributions usually have medians that are not at the centre of the interquartile range, and non-symmetric whiskers.

(4) Where boxplots are based on *samples* from a *population*, it is more likely that the larger samples will contain *outlier* observations, the values of which may vary from sample to sample, hence caution is required in comparing boxplots which are based on samples of varying size. However, where the boxplots are based on all observations in a fully enumerated population, rather than just a sample from that population, the population characteristics can be directly compared across plots.

(5) In the present study all boxplots are based on fully enumerated populations of schools, except for those in figure 8.1 which is based on a sample of pupils from the overall pupil population.

The width of the boxplots in figure 8.1 is proportional to the sample numbers in each category on the x-axis. However, the boxplots in that figure were based on an early verion of the SYSTAT program that employed a character graphics font to draw the figures. For this reason the degree of resolution in constructing the figures to scale is relatively low (<72x72 dpi), and only one of the boxplots is based on a sufficiently larger number of cases to be constructed as wider than the other boxplots in the graph. The other boxplots in chapter 8 are also drawn with this low resolution method, but those in later chapters are based on a substantially upgraded version of the software that produces 300x300 dpi resolution output.

Appendix C

This appendix provides a formal description of the multilevel models employed in this study, and some comments on the methods used to fit these models.

A two-level model

Model specification

The model can be written as:

$$y_{ij} = \beta_{j0} + \beta_{j1} X_{ij1} + \varepsilon_{ij} \qquad C1$$

The subscripts *i* and *j* designate pupils and schools, respectively. The X_{ij1} represents a variable measuring some relevant pupil characteristic upon which the estimate of school means is to be conditioned.

If we were interested in estimating only the mean attainment and slopes for the particular schools in the sample, then it would be appropriate to treat the β_{j0} and β_{j1} parameters as fixed. However, the schools in the data are only a sample from the population and we wish to make inferences to the wider super-population from which the schools in the data are assumed to be drawn . Hence, it is appropriate to treat these parameters as random.

If we are treating as random then each may be written as the sum of a constant component plus a random variable with a mean value of zero, *viz*:

$$\beta_{j0} = \delta_0 + \mu_{j0} \qquad C2$$

$$\beta_{j1} = \delta_1 + \mu_{j1} \qquad C3$$

where the second component of each expression is a random variable.

By substituting C2 and C3 into C1 we obtain a single-equation representation of the model:

$$y_{ij} = \delta_0 + \mu_{j0} + (\delta_1 + \mu_{j1})X_{ij1} + \varepsilon_{ij} \qquad C4$$

which, after collecting terms is

$$y_{ij} = \delta_0 + \delta_1 X_{ij1} + (\mu_{j1}X_{ij1} + \mu_{j0} + \varepsilon_{ij}) \qquad C5$$

In C5 the first two terms are the *fixed* part of the model and the terms collected in parentheses are the *random* part of the model. We note that the random part contains a term which is a function of the covariate X_{ij1}, hence ordinary least squares estimation procedures will not be efficient, and the estimated standard errors will be too small.

Assumptions

The formal assumptions made in estimating the above model are that each of the random terms has a mean of zero and a constant variance:

$$E(\varepsilon_{ij}) = 0 \qquad var(\varepsilon_{ij}) = \sigma^2$$

$$E(\mu_{j0}) = 0 \qquad var(\mu_{j0}) = \sigma_0^2$$

$$E(\mu_{j1}) = 0 \qquad var(\mu_{j1}) = \sigma_1^2$$

and that the cross-level random term covariances are zero,

$$cov(\varepsilon_{ij},\mu_{j0}) = 0.$$

$$cov(\varepsilon_{ij},\mu_{j1}) = 0.$$

but the level-two random terms are, in general, assumed to have a non-zero covariance,

$$cov(\mu_{j0},\mu_{j1}) = \sigma_{01}.$$

Further, all the random terms are assumed to have normal distributions.

Commments regarding the estimation of the models

The models employed in this study were estimated using the initial version of the VARCL software developed by Dr Nick Longford at Lancaster University, and the HLM software developed by Professors Steve Raudenbush of Michigan State University and Tony Bryk of Chicago University. The VARCL program employed a Fisher scoring/maximum likelihood method for fitting the model and estimating parameters (Longford, 1987). However, it constrained the covariances among the random error terms at level-two to be zero. Goldstein (1987) shows that this restriction may result in estimates which are sensitive to the origin chosen for the covariates in the model. The estimates in chapters 8 and 9 are based upon this program, as it was the only program of its type that was available, and capable of handling the large data sets analysed, at the time.

The HLM program estimates the parameters of the model using an Empirical Bayes method which allows for all of the assumptions described above, including covariances among the

random error terms at level-two (Raudenbush and Bryk, forthcoming†). A prototype version of the program became available during the course of this research and was employed for subsequent chapters.

Terminology

The term *random effects* is employed to refer to estimates of the conditional means from the above models (ie.the estimates of μ_{j0}). These *posterior*, or *shrunken*, means have less variance than the observed (OLS) conditional residuals for the higher-level (level-two) units (Goldstein, 1987). Raudenbush and Bryk (1986) describe the variance of the conditional means as the *true* parameter variance, compared to the *observed* variance of the OLS mean residuals. They describe the ratio of this true parameter variance to the observed variance as the reliability of the estimate of the corresponding model parameter. Thus, I refer to the variation in the estimates of the conditional means as the *systematic* variation in the observed school means. This terminology is employed to indicate that the aim of the explanatory variables employed in level-two of the model is to explain the reliable, or systematic, component of observed school mean attainment. By definition, the remainder of the variation in observed school means is random, or non-systematic, hence is not susceptible to explanation by school-level explanatory variables.

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† 'Examining correlates of diversity'. Paper under revision for publication in Journal of Educational Statistics.

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References

Aitkin, M. & Bennett, N. (1980). **A theoretical and practical investigation into the analysis of change in classroom based research.** Final Report to the SSRC for Grant No HR5710.

Aitkin, M. and N. Longford (1986). 'Statistical modelling issues in school effectiveness studies.' **Journal of the Royal Statistical Society**, Series A, 144, 419-461.

Alexander K.L., & A.M. Pallas (1982). 'Reply to Coleman.' **American Sociological Review**, 47,822-824.

Alexander K.L., & A.M. Pallas (1983). 'Private schools and public policy: New evidence on cognitive achievement in public and private schools.' **Sociology of Education**, 56, 170-82.

Alexander K.L., & A.M. Pallas (1985). 'School sector and cognitive performance: when is a little a little?' **Sociology of Education,** 58(2), 115-128.

Alexander, K. L., & Eckland, B. K. (1975). 'Contextual effects in the high school attainment process.' **American Sociological Review**, 40, 402-406.

Alexander, K. L., & Griffin, L. J. (1976). 'School district effects on academic achievement: A reconsideration.' **American Sociological Review,** 41, 144-152.

Alexander, K. L., & McDill, E. L. (1976). 'Selection and allocation within schools: Some causes and consequences of curriculum placement.' **American Sociological Review,** 41, 963-980.

Alexander, K. L., Cook, M. M., & McDill, E. L. (1978). 'Curriculum tracking and educational stratification: Some further evidence.' **American Sociological Review**, 43, 47-66.

Alexander, K. L., Fennessey, J., McDill, E. L., & D'Amico, R. J. (1979). 'School SES influences-composition or context?' **Sociology of Education,** 52, 222-237.

Alwin, F. D., & Otto, L. B. (1977). 'High school context effects on aspirations.' **Sociology of Education**, 50, 259-273.

Anderson, C. S. (1982). 'The search for school climate: A review of the research.' **Review of Educational Research**, 52(3), 368-420.

Anderson, C. S. (1983). **Education and Opportunity in Victorian Scotland.** Oxford: Clarendon Press.

Anderson, C. S. (1986). 'Opportunity to Learn.' In. T. Husen and T. N. Postlethwaite. (Eds.), **The International Encyclopedia of Education.** Oxford: Pergamon Press.

Anderson, C. S. (1987). 'The classroom environment study: teaching for learning.' **Comparative Education Review**, 31(1),69-87.

Arlin, M. (1984). 'Time, equality, and mastery learning.' **Review of Educational Research**, 54, 65-86.

Armor, D., Conry-Oseguera, P., Cox, M., King, N., McConnell, L., Pascal, A., Pauly, E., & Zellman, G. (1976). 'Analysis of the school preferred reading program in selected Los Angeles minority schools (Report No.R-2007-LAUSD). Santa Monica, FA: The Rand Corporation. (ED 130243)

Azumi, J., & Madhere, S. (1983, April). 'Professionalism, power and performance: The relationships between administrative control, teacher conformity and student achievement. Paper presented at the annual meeting of the American Educational Research Association, Montreal, Canada.

Bachman, J. G., & O'Malley, P. M. (1978). 'The search for school effects: some new findings and perspectives.' Institute for Social Research, University of Michigan.

Ball, S. J. (1981). **Beachside Comprehensive: A case-study of secondary schooling.** Cambridge: Cambridge University Press.

Barr, R., & Dreeben, R. (1983). **How schools work.** Chicago: University of Chicago Press.

Berman, P. (1981). 'Educational change: An implementation paradigm. In.R. Lehming & M. Kane (Eds.), **Improving schools.** Beverly Hills, CA: Sage.

Berman, P., & McLaughlin, M. W. (1975). **Federal programs supporting educational change: The findings in review.**(Vol. 4). Santa Monica, CA: The Rand Corporation.

Berman, P., & McLaughlin, M. W. (1977). **Federal progress supporting educational change: Factors affecting implementation and continuation** (Vol. 7). Santa Monica, CA: The Rand Corporation.

Berman, P., & McLaughlin, M. W. (1978). **Federal programs supporting educational change** (Report No. R-1589/4-HEW). Santa Monica, CA: Rand Corporation.

Bidwell, C. E., & Kasarda, J. D. (1975). 'School district organization and student achievement.' **American Sociological Review**, 40, 55-70.

Bidwell, C. E., and Kasarda, J. D. (1980). 'Conceptualizing and measuring the effects of school and schooling.' **American Journal of Education**, 88(4), 401-430.

Black, H. D. (1985, August). 'Centre-peripheral change in assessment-does it work? A local authority case study.' Paper presented to the annual conference of the British Educational Research Association, Sheffield.

Black, H. D., Alexander, D., Boyle, E., & Goring, R. (1984). **Administering change in assessment - a local authority case study.** Edinburgh: SCRE.

Blackstone, T. S. (1981, June). 'Demography and the Employment of Teachers.' Paper presented at the conference of the Social Science Research Council.

Block, J. H., & Burns, R. B. (1976). 'Mastery learning.' In L. S. Shulman.(Ed.), **Review of research in education** (Vol. 4). Itasca, IL: Peacock.

Bloom, B. S. (1976) **Human characteristics and school learning**. New York: McGraw-Hill.

Bloom, B. S. (1984) The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. **Educational Research,** 13(6),4-16.

Borg, W. (1980) Time and school learning. In C. Denham & A. Lieberman.(Eds.), **Time to learn**. Washington, DC: National Institute of Education.

Boyer, E. L. (1983) **High School: a report of secondary education in America.** Harper & Row: New York.

Boruch, F. R. and Cordray, D. S. (1980). **An Appraisal of Educational Program Evaluations: Federal, State, and Local Agencies.** Evanston, Illinois: Northwestern University.

Breckenridge, E. (1976). 'Improving school climate.' **Phi Delta Kappan,** 58, 314-318.

Briault, E., & Smith, F. (1980). **Falling School Rolls in Secondary Schools.** Slough: NFER.

Bridge, R. G., Judd, C. M., & Moock, P. R. (1979). **The determinants of educational outcomes: The impact of families, peers, teachers, and schools.** Cambridge, MA: Ballinger.

Brimer, A., Madaus, G., Chapman, B., Kellaghan, T., & Wood, R. (1978). **Sources of difference in school achievement**. Slough: NFER.

Brookover, W. B. (1980). **School learning climate and student achievement: A social systems approach to increased student learning.** Tallahassee, FL: Florida State University, National Teacher Corps.

Brookover, W. B., &.Lezotte , L. W. (1979). **Changes in school characteristics coincident with changes in student achievement.** East Lansing: Institute for Research on Teaching, Michigan.State.University.

Brookover, W. B., &.Lezotte, L. W. (1977). **Changes in school characteristics coincident with changes in student achievement.** (Executive Summary). East Lansing, MI: Michigan State University, College of Urban Development.

Brookover, W. B., Beady, C., Flood, P., Schweitzer, J., & Wisenbaker, J. (1979). **School social systems and student achievement: Schools can make a difference.** New York: Praeger.

Brookover, W. B., Schneider, J. M. (1975). 'Academic environments and elementary school achievement.' **Journal of Research and Development in Education**, 9, 82-91.

Brown, B. W., & Saks, D. H. (1981). The micro-economics of schooling. In D. C. Berliner (Ed.), **Review of Research in Education**, 19, 217-284.

Bryk, A. S., Holland, P. B., Lee, V.E., and Carriedo, R. A. (1984). **Effective Catholic Schools: An Exploration.** Washington, D.C.: National Catholic Education Association.

Brown, P. J. E., & Ferguson, S. S. (1978). **To close or not to close: an educational question - towards a method for evaluating primary school closure strategies for inner city areas**. Liverpool University.

Burlingame, M. (1981). 'Superintendent power retention.' In.S. B. Bacharach (Ed.), **Organizational Behavior in Schools and School Districts.** pp. 429-64. New York: Praeger.

Burnhill, P. (1984). 'The 1981 scottish school Leavers Survey'. In D. Raffe (ed), **Fourteen to Eighteen: the Changing Pattern of Schooling in Scotland.** Aberdeen University Press: Aberdeen.

Burnhill, P., J. Lamb, and P. Weston (1984). **Collaborative Research Dictionary and Questionnaires 1981.** Edinburgh: Centre for Educational Sociology, University of Edinburgh.

Burstein, L. (1980). 'The role of levels of analysis in the specification of educational effects.' In. Dreeban & J.A. Thomas (Eds.), **The Analysis of Educational Preductivity: issues in microanalysis.** Cambridge, Mass.:Ballinger.

Burstein, L. and Gustaffson, J. (1983). 'Methodological investigations of systematically varying slopes.' Graduate School of Education, University of Los Angeles.

Burstein, L. and M. Miller (1980). 'Regression based analysis of multi-level educational data.' **New Directions for Methodology of Social and Behavioral Science**, 6, 194-211.

Cahan, L. S., Filby, N. N., McCutcheon, G., & Kyle, D. (1983). **Class size and instruction: A field study.** New York: Longman.

Cain, G. G. and Goldberger, A. S. (1983). 'Public and private schools revisited.' **Sociology of Education,** 56(4), 208-218.

Carroll, J. B. (1963). 'A model of school learning.' **Teachers College Record,** 64, 722-733.

Chavez, R. C. (1984). 'The use of high-inference measures to study classroom climates: A review.' **Review of Educational Research**, 54,(2),237-261.

Clark, D. L., Lotto, L. S., & Astuto, T. A. (1984). 'Effective schools and school improvement: A comparative analysis of two lines of inquiry.' **Educational Administration Quarterly,** (summer).

Clark, D. L., Lotto, L. S., & McCarthy, M. M. (1980). 'Secondary source study of exceptionality in urban elementary schools.' In Phi Delta Kappa, **Why do some urban schools succeed? The Phi Delta Kappa study of exceptional urban elementary schools.** Bloomington: Phi Delta Kappa and Indiana University.

Clifford, P., & Heath, A. (1984). 'Selection does make a difference.' **Oxford Review of Education,** 10(1), 85-97.

Coleman, J. S. (1975). 'Methods and results in the IEA studies of effects of school on learning.' **Review of Educational Research**, 45, 335-386.

Coleman J.S. and T. Hoffer (1987). **Public and Private High Schools: The Impact of Communities.** Basic Books: New York.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J. M., Mood, J. M., Weinfeld, F. D., & York, R. L. (1966). **Equality of opportunity.** Washington, DC: Government Printing Office.

Coleman, J. S., E. Q. Campbell, C. J. Hobson, J. M. McPartland, J.M. Mood, F. D. Weinfeld, & R. L. York (1966). **Equality of Educational Opportunity**. Washington, DC: US. Government Printing Office.

Coleman, J. S., Hoffer, T., and Kilgore, S. (1982a). 'Cognitive outcomes in public and private schools.' **Sociology of Education**, 55, 65-76.

Coleman, J. S., Hoffer, T., and Kilgore, S. (1982b). 'Achievement and segregation in secondary schools: a further look at public and private school differences.' **Sociology of Education,** 55, 162-182.

Coleman, J. S., Hoffer, T., and Kilgore, S. (1982c). **High School Achievement: Public, Catholic and Other-Private Schools Compared.** New York: Basic Books.

Coleman, J.S., Hoffer, T., & Kilgore, S. (1983). **High School Achievement**. NY: Basic Books.

Cooley, W. W., & Leinhardt, G. (1980). 'The Instructional Dimensions Study.' **Educational Evaluation and Policy Analysis**, 2, (1), 7-25.

Cox, W. B. (1978). 'Crime and punishment on campus: An inner city case.' **Adolescence**, 13, 339-348.

Cronbach, L.J. (with J. E. Deken & N. Webb) (1976). 'Research on classrooms and schools: Formulation of questions, design, and analysis.' Occasional Paper, Stanford Evaluation Consortium, Stanford, California.

Cuban, L. (1983). 'Effective schools: A friendly but cautionary note.' **Phi Delta Kappan**, 64, 659-696.

Cusick, P. A. (1973). **Inside high school.** New York: Holt, Rinehart, & Winston.

Cuttance, P. (1979). 'Psycho-social environment of the school: reinforcing the social class structure.' **Political Science**, 31, 39-53.

Cuttance, P. F. (1980a). 'Coleman, Plowden, Jencks and now, Rutter: An assessment of a recent contribution to the debate on school effects.' **Scandinavian Journal of Educational Research**, 3, 191-205.

Cuttance, P. F. (1980b). 'The influence of schooling on student academic outcomes: A critical assessment of findings produced in the neo-classical paradigm of school effects research.' **Canadian and International Education**, 9(2),43-70.

Cuttance, P. F. (1980c). 'Do schools consistently influence the performance of their students?' **Educational review**, 32,(3), 267-280.

Cuttance, P.F. (1983). 'Public and private schools, tax credits and tuition vouchers: a review of a comparison of the performance of public, Catholic, and private schools in America.' **British Journal of Sociology of Education**, 4, 363-273.

Cuttance, P. F. (1985). 'Methodological issues in the statistical analysis of data on the effectiveness of schooling.' **British Educational Research Journal,** 11, 163-179.

Cuttance, P. F. (1986) Curriculum: the frog prince of school effectiveness research. **Curriculum Studies**,

Cuttance, P (1986). **Effective Schooling: A Report to the Scottish Education Department**. Edinburgh: Centre for Educational Sociology, University of Edinburgh.

D'Amico, J. J. (1982). 'Using effective schools studies to create effective schools: No recipe yet.' **Educational Leadership**, 40,(3), 60-62.

Dahllof, U. S. (1971). **Ability grouping, content validity and curriculum process analysis.** New York: Teachers College Press.

Darragh, J. (1953). 'Catholic population of Scotland since 1680.' **Innes Review**, IV(I).

Dealy, Sr. M. B. (1945). **Catholic Schools in Scotland.** Washington, D.C.: Catholic University of America Press.

Department of Education and Science. (1981). **School curriculum** (Circular 6/81). DES: London.

Department of Education.and Science. (1984). **Education observed 2: A review of published reports by HM Inspectors on primary schools and 11-16 and 12-16 comprehensive schools.** London: DES.

Department of.Education and.Science. (1985a). **Better schools** (Cmnd. 9469). London: HMSO.

Department of Education and Science.(19 **) **Redundancy Compensation Payments to University Staff.** Report by the Comptroller and Auditor General.

Department of Education and Science. (1985b). **Quality in schools: Evaluation and appraisal.** London: HMSO.

Dreeban, R., and Barr, R. (1987). 'An organizational analysis of curriculum and instruction.' In. M. Hallinan (Ed.), **The Social Organization of Schools.** New York: Plenum.

Duffy, M (1987) 'Why Baker recdeived the wrong message in America.' **The Independent**, October 22.

Duke, D. L., & Perry, C. (1978). 'Can alternative schools succeed where Benjamin Spock, Spiro Agnew, and B. F. Skinner have failed?' **Adolescence,** 13, 375-392.

Duncan, O. D. (1961). ' A sociometric index for all occupations.' In. A.J. Reiss, Jr. (Ed.), **Occupations and Social Status.** New York: Free Press.

Eder, D. (1981). 'Ability grouping as a self-fulfilling prophecy: A micro-analysis of teacher-student interaction.' **Sociology of Education**, 54, 151-162.

Edmonds, R. R. (1979a). **A discussion of the literature and issues related to effective schooling.** Cambridge, MA: Center for Urban Studies, Harvard Graduate School of Education.

Edmonds, R. R. (1979b). 'Effective schools for the urban poor.' **Educational Leadership**, 37, 15-27.

Edmonds, R. R. (1979c). 'Some schools work and more can.' **Social Policy**, 9, (2), 28-32.

Edmonds, R. R. (1981). 'Making public schools effective.' **Social Policy,** 12, (2), 56-60.

Edmonds, R. R. (1982). 'Programs of school improvement: An overview.' **Educational Leadership**, 40, (3), 4-11.

Edmonds, R. R., &.Frederiksen, J. R. (1978). **Search for effective schools: The identification and analysis of city schools that are instructionally effective for poor children.** Cambridge, MA: Center for Urban Studies, Harvard Graduate School of Education (ED 170396).

Educational Institute of Scotland (1981). **Falling school rolls.(**Report No. 2). Report of the Educational Institute of Scotland Ad.Hoc. Committee.

Eggleston, J. (1977). **The Ecology of the School.** London: Methuen.

Ellett, C. D., &.Walberg, H. J. (1979). 'Principals' competency, environment, and outcomes.' In.H. J. Walberg.(Ed.), **Educational environments and effects.** Berkeley, CA: McCutchan.

Ellett, C. D., Payne, D. A., Masters, J. A., & Pool, J. E. (1977, May). 'The relationship between teacher and student assessments of school environment characteristics and school outcome variables.' Paper presented at the 23rd annual meeting of the South eastern Psychological Association, Hollywood, FA.

Epstein, J. L. (ed) (1981). **The Quality of School Life**, Lexington Books:Toronto.

Epstein, J. L., & McPartland, J. M. (1976). 'The concept and measurement of the quality of school life.' **American Educational Research Journal,** 13, 15-30.

Erbring, L. and Young, A.A. (1979). 'Individuals and social structure: contextual effects as endogenous feedback.' **Sociological Methods and Research,** 7(4) 396-430.

Fitzpatrick, T. A. (1986). **Catholic Secondary Education in South-West Scotland Before 1972.** Aberdeen: Aberdeen University Press.

Fogelman, K. (1976). **Britain's Sixteen-Year-Olds.** London: National Childrens Bureau.

Fogelman, K. (1984). 'Problems in comparing examination attainment in selective and comprehensive secondary schools.' **Oxford Review of Education,** 10, 33-43.

Freer, M., & Dawson, J. (1985). 'Don't evaluate your teachers.' **Phi Delta Kappan,** 66(10), 720-722.

Fullan, M. (1982). **The meaning of educational change**. New York: Teachers College Press.

Galloway, D. (1981). **Teaching and counselling: Pastoral care in primary and secondary schools**. London: Longman.

Galloway, D. (1982). 'Persistent unauthorized absence.' **Educational Research,** 24, 188-196.

Galloway, D. (1983). 'Disruptive pupils and effective pastoral care.' **School Organization**, 3, 245-254.

Galloway, D. (1985). 'Pastoral care and school effectiveness.' In. D. Reynolds (Ed.), **Studying school effectiveness** (pp. 75-86). Lewes: Falmer.

Galloway, D. M., Boswell, K., Panckhurst, F., Boswell, C., & Green, K. (1982b). 'Satisfaction with teaching.' **National Education (NZ)**, 64, 206-213.

Galloway, D. M., Panckhurst, F., Boswell, K., Boswell, C., & Green, K. (1982a). 'Sources of stress for class teachers.' **National Education. (NZ)**, 64, 164-169.

Galloway, D. M., Wilcox, B. and Martin, R. (1984). 'Persistent absence from school and exclusion from school: the predictive power of school and community variables.' **British Educational Research Journal**

Galloway, D., Ball, C., Blomfield, D., &.Seyd, R. (1982). **Schools and disruptive pupils.** London: Longman.

Gamoran, A. (1986). 'Instructional and institutional effects of ability grouping.' **Sociology of Education,** 59(4), 185-198.

Gersten, R., Carnine, D., &.Green, S. (1982). The principal as instructional leader: a second look. **Educational Leadership**, December, 47-50.

Glass, G. V., Cahan, L. S., Smith, M. L., & Filby, N. N. (1982). **School class size: Research and policy**. Beverly Hills, CA: Sage.

Glass, G. V., McGaw, B. and Smith, M. L. (1981). **Meta Analysis in Social Research.** Beverley Hills: Sage.

Glenn, B. C. (1981). **An examination of effective schools for poor black children.** Cambridge, MA: Harvard University, Center for Law and Education.

Goodlad, J. I. (1983). **A place called school**. New York: McGraw-Hill.

Goldberger, A.S. (1981). 'Linear regression after selection.' **Journal of Econometrics**, 15, 357-66.

Goldberger, A.S., & G.G. Cain (1982).'The causal analysis of cognitive outcomes in the Coleman, Hoffer and Kilgore report.' **Sociology of Education**, 55, 103-22.

Goldstein, H. (1984). 'The methodology of school comparisons.' **Oxford Review of Education,** 10(1), 69-74.

Goldstein, H. (1986). 'Multilevel mixed linear model analysis using iterative generalised least squares.' **Biometrica**, 73 (1) 43-56.

Goldstein, H. (1987). **Multilevel Models in Educational and Social Research.** London: Institute of Education, University of London.

Goldthorpe, J. H., and Hope, K. (1974). **The Social Grading of Occupations: A new approach and scale.** London: Oxford University Press.

Gray, J. (1981a). 'A competitive edge: examination results and the probable limits of secondary school effectiveness.' **Educational Review,** 33, 25-35.

Gray, J. (1981b). 'The search for more effective schools: Problems and progress on studies related to British.schools.' **British Educational Research Journal**

Gray, J. (1987). **Times Educational Supplement**

Gray, J. and V. Hannan (1986). 'HMI's interpretations of schools' examination results.' **Journal of Educational Policy**, 1,23-33.

Gray, J., A. McPherson, & D. Raffe (1983). **Reconstructions of Secondary Education: Theory Myth and Practice since the War**. London: Routledge and Kegan Paul.

Gray, J., D.Jesson, and B. Jones (1986). 'The search for a fairer way of comparing schools' examination results'. **Research Papers in Education**, 1, 91-119.

Gronn, P. (1983). 'Talk as work: The accomplishment of school administration.' **Administrative Science Quarterly**, 28, 1-21.

Guthrie, J. W., Kleindorfer, G. B., Levin, H. M., & Stout, R. T. (1971). **Schools and inequality.** Cambridge, MA: MIT Press.

Hage, J. (1980). **Theories of organizations.** New York: John Wiley & Sons.

Hallinan, M. T., & Sorensen, A. B. (1983). 'The formation and stability of instructional groups.' **American Sociological Review**, 48,(6), 838-851.

Hallinan, M. T., & Sorensen, A. B. (1985). 'Class size, ability group size, and student achievement.' **American Journal of Education**, 94(2), 71-89.

Halsey, A. H. (Ed.). (1972). **Trends in British Society Since 1900: A Guide to the Changing Social Structure of Britain.** MacMillan: London.

Hamblin, D. H. (1977). 'Caring and control: The treatment of absenteeism.' In H. C. M. Carroll.(Ed.), **Absenteeism in South Wales: Studies of pupils, their homes and their secondary schools.** Swansea: University College of Swansea, Faculty of Education.

Hamblin, D. H. (1978). **The teacher and pastoral care**. Oxford: Blackwell.

Hammersley, M. (1980). 'A.peculiar world? Teaching and learning in an inner-city school.' Unpublished doctoral thesis, University. of Manchester.

Hannan, M. and I. Burstein (1974). 'Estimation from grouped observations.' **American Sociological Review**, 39, 374-92.

Hanson, E. M. (1981). 'Organizational control in educational systems: A case study of governance in schools.' In.S. B. Bacharach.(Ed.), **Organizational Behavior in Schools and School Districts** (pp. 245-76). New York: Praeger.

Hanushek, E. A. (1971). 'Teacher characteristics and gains in student achievement: Estimation using.micro data.' **American Economic Review**, 6(12), 280-288.

Hanushek, E. A. (1981). 'Throwing money at schools.' **Journal of Policy Analysis and Management**, 1, 19-41.

Hargreaves, A. (1984a). 'Experience counts, theory doesn't: How teachers talk about their work.' **Sociology of Education**, 57, 244-254.

Hargreaves, A. (1984b). 'Educational policy and the culture of.teaching: Some prospects for the future.' Paper presented at the annual meeting of the American Educational Research Association, New Orleans.

Hargreaves, A. (forthcoming). **The sociology of educational policy and practice.** London: Routledge and Kegan Paul.

Hargreaves, D. H. (1967). **Social relations in a secondary school**. London: Routledge and Kegan Paul.

Hargreaves, D. H. (1982). **The challenge for the comprehensive school.** London: Routledge and Kegan Paul.

Hargreaves, D.H. (chairman)(1984).**Improving Secondary Schools**. A Report of the Committee on the Curriculum and Organisation of Secondary Schools. Inner London Educational Authority, London.

Harnischfeger, A., & Wiley, D. E. (1976). 'Exposure to schooling: Method, conclusions, policy.' **Educational Researcher,** 5(2), 18.

Hauser, R. M. (1970). 'Context and consex: A cautionary tale.' **American Journal of Sociology**, 75, 645-664.

Hauser, R. M. (1974). 'Contextual analysis revisited.' **Sociological Methods and Research,** 2, 365-375

Heckman, J. J. (1976).'The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator of such models.' **Annals of Economic and Social Measurement**, 5, 4675-92.

Hedges, L. & I. Olkin (1985). **Statistical Methods for Meta-Analysis**. NY: Academic Press.

Heraud, B. J. (1964). 'Social class and the New Towns.' **Urban Studies**, 1, 42-58.

Heyns, B., and Hilton, T. L. (1982). 'The cognitive tests for high school and beyond: an assessment.' **Sociology of Education**, 55, 89-102.

Hoffer, T., Greeley, A. M., and Coleman, J. S. (1985). 'Achievement growth in public and Catholic schools.' **Sociology of Education**, 58(2), 74-97.

Honig, B. (1985). 'The educational.excellence movement: Now comes the hard part.' **Phi Delta Kappan**, 66(10), 675-681.

Hope, K. (1985). **As Others See Us**. NY: Cambridge University Press.

Hopkins, D. (1985). 'School based.review: An international survey.' **Compare,** 15(1), 79-93.

House, E. R. (1986). 'How we think about education.' In. E. R. House (Ed.), **New Directions in Educational Evaluation.** Lewes, Sussex: Falmer Press.

Howell, B. (1981). 'Profile of the principalship.' **Educational Leadership,** 38,333-336.

Insel, P. M., &.Moos, R. H. (1974). 'Psychological environments: Expanding the scope of human ecology.' **American.Psychologist**, 29, 179-188.

Jackson, P. (1968). **Life in classrooms.** New York: Holt, Rinehart and Winston.

James, T., & Tyack, D. B. (1983). 'Learning from past efforts to reform the high school.' **Phi Delta Kappan**, 64, 400-406.

Jencks, C. S., (1985). 'How much do high school students learn?' **Sociology of Education**, 58(2), 128-135.

Jencks, C. S., & Brown, M. D. (1975). 'Effects of high schools on their students.' **Harvard Education Review**, 43, (3), 273-324.

Jencks, C. S., Smith, M., Acland, H., Bane, M. J., Cohen, D., Gintis, H., Heyns, B., and Michelson, S. (1972). **Inequality: A reassessment of the effect of family and schooling in America.** New York: Basic Books.

Jones, A. (1980). 'The school's view of persistent non-attendance.' In. L. Hersov and I. Berg.(Eds.), **Out of school: Modern perspectives in truancy and school referral.** Chichester: Wiley.

Karweit, N. L. (1976). 'Quantity of schooling: A major educational vehicle?' **Educational Researcher,** 5(2), 15-17.

Karweit, N. L. (1985). 'Should we lengthen the school term?' **Educational Researcher**, 14(6), 9-15.

Karweit, N. L., &.Slavin, R. E. (1981). 'Measurement and modelling choices in studies of time and learning.' **American Educational Research Journal,** 18(2), 157-171.

Keddie, N. (1971). 'Classroom knowledge.' In.M. F. D. Young. (Ed.), **Knowledge and Control**. London: Collier MacMillan.

Keesling, J. W., and Wiley, D. (1974). 'Regression models for hierarchical data.' Paper presented at the Annual Meeting of the Psychometric Society, Stanford University.

Kerckhoff, A. C. (1976). 'The status attainment process: socialization or allocation?' **Social Forces,** 55, 368-381.

Kottkamp, R., & Azumi, J. (1983). 'Communication, multidimensional school effectiveness and the assumption of neutrality of impact.' Paper presented at the Eastern Educational Research Association, Baltimore.

Lacey, C. (1970). **Hightown Grammar Manchester:** Manchester University Press.

Law, A. (1965). **Education in Edinburgh in the eighteenth century.** London: University of London Press.

Lee, V. E. (1986). 'Multi-level causal models for social class and achievement.' Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Leibenstein, H. (1980). **Beyond economic man: a new foundation for micro-economics**. Cambridge, Mass.: Harvard University Press.

Leeuw de, J. & I. Kreft (1986). 'Random coefficient models for multilevel analysis.' **Journal of Educational Statistics**, 1, 57-85.

Levin, H. M. (1984). 'About time for educational reform.' **Educational Evaluation and Policy Analysis**, 6(2), 151-163.

Lewis, J. (1985). 'The theoretic underpinnings of school change strategies.'In D. Reynolds (Ed.) **Studying school effectiveness**.(pp. 137-153). Lewes: Falmer.

Lezotte, L. W., Hathaway, D. V., Miller, S. K., Passalacqua, J., &. Brookover, W. B. (1980). **School learning climate and student achievement: A social systems approach to increased student learning.** Tallahassee, FA: Florida State University, National Teacher Corps.

Licata, J. W., Willower, D., & Ellett, C. D. (1978). 'The school and environmental robustness: An initial inquiry.' **Journal of Experimental Education**, 47, 325-350.

Little, J. W. (1982). 'Norms of collegiality and experimentation: Workplace conditions of school success.' **American Educational Research Journal,** 19(3), 325-340.

Longford, N (1985). 'A fast scoring algorithm for maximum liklihood estimation in unbalanced mixed models with nested random effects.' Lancaster: Centre for Applied Statistics, University of Lancaster.

Lortie, D. (1975). **Schoolteacher**. London: University of Chicago Press.

Lothian Region Education Department. (1982). **The implication of falling school rolls in secondary schools.**

Lundgren, U. P. (1972). **Frame factors and the teaching process**.Stockholm: Almqvist & Wiksell.

MacDonald, K. I. (1983). 'Exploratory data analysis: a process and a problem.' In. D. McKay, N. Schofield, and P. Whiteley (Eds.), **Data Analysis and the Social Sciences**. London: Pinter.

MacFadyen, I., & McMillan, F. (1984). **The Management of Change at a Time of Falling School Rolls**. Scottish Council for Research in Education, Edinburgh.

MacKenzie, D. E. (1983a). 'Research for school improvement: An appraisal of some recent trends.' **Educational Researcher**, 112(4), 5-19.

MacKenzie, D. E. (1983b). 'School effectiveness research: A synthesis and assessment.' In.P. C. Dattweiler (Ed.), **Educational Productivity and School Effectiveness**. Texas: Southwest. Educational Development Laboratory.

Madalla, G. S. (1983). **Limited-Dependent and Qualitative Variables in Econometrics**. NY: Cambridge University Press.

Madaus, G (1981) 'Minimum compteency testing: a critical overview.' Paper presented at the 46th Annual Conference of the Educational records Bureau. New York, October 23.

Madaus, G. E., Airasian, P. W., &. Kellaghan, T. (1980). **School effectiveness: A reassessment of the evidence**. New York: McGraw-Hill.

Madaus, G., Kellaghan, T., Rakow, E., & King, D. (1979). 'The sensitivity of measures of school.effectiveness. **'Harvard Educational Review**, 49, 207-230.

Marjoribanks, K. (1979). **Families and their learning environments: An empirical analysis**. Routledge and Kegan Paul.

Marks, J. & C. Cox (1984). 'Educational attainment in secondary schools.' **Oxford Review of Education**, 10, 7-31.

Marks, J. & M. Pomian-Srzednicki (1985).'Standards in English schools second report: an analysis of the examination results of secondary schools in England for 1982 and comparisons with 1981.' National Council for Educational Standards: London.

Marks, J., C. Cox, & M. Pomian-Srzednicki (1983).'Standards in English schools.' London: National Council for Educational Standards.

Mason, W. M., G. Y. Wong, & B. Entwistle (1985). 'The multilevel linear model: a better way to do contextual analysis.' **Sociological Methodology 1983-84**, 72-103.

Maxwell, R. E. (1968). 'Leader.behavior of principals: A.study of ten inner-city elementary schools of Flint, Michigan.' (Unpublished doctoral dissertation, Wayne State.University, 1967). Dissertation.Abstracts, 28A, 2950A.

Mazzarella, J. A. (1977). 'The.principal's role as an instructional leader.' Burlingame, CA: Association of California School Administrators.

McDill, E. L., & Rigsby, L. C., & Meyers, E. D., Jr. (1969). 'Educational climates of high schools: Their effects and sources.' **The American Journal of Sociology,** 74, 567-586.

McDill, E. L., &.Rigsby, L. C. (1973). **Structure and process in secondary schools: The academic impact of educational climates.** Baltimore, MD: Johns Hopkins University Press.

McGill, R., Tukey, J. W., and Larsen, W. A. (1978). 'Variation of box plots.' **The American Statistician,** 32, 12-16.

McPartland, J. M., and McDill, E. L. (1982). 'Control and differentiation in the structure of American education.' **Sociology of Education**, 55, 77-88.

McPartland, J. M., McDill, E. L., Lacey, C., Harris, R. J. and.Novey, L. B. (1972). **Student participation in High School decisions: a study of 14 urban High Schools.** Report No.95. Centre for the Social Organisation of Schools, Johns Hopkins University: Baltimore.

McPherson, A. (1983). 'An angle on the geist: persistence and change in the Scottish Educational Tradition.' In. W. Humes and H. Paterson (Eds.), **Scottish Culture and Scottish Education 1800- 1980.** Edinburgh: John Donald.

McPherson, A. F. (1984). 'Post-compulsory schooling: The fifth year.' In. D. Raffe.(Ed.), **Fourteen to eighteen: The changing pattern of schooling in Scotland.** Aberdeen: Aberdeen University Press.

McPherson, A. F., & C . D. Raab (1987). **Governing Education: A Sociology of Policy Since 1945**. Centre for Educational Sociology, University of Edinburgh.

McPherson A. and D. Willms (1986). 'Certification, class conflict, religion, and community: a socio-historical explanation of the effectiveness of contemporary schools.' **Research in Sociology of Education and Socialisation,** 6, 227-302.

McPherson, A. F. & J. D. Willms (1987). 'Equalisation and improvement: some effects of comprehensive reorganisation in Scotland. Centre for Educational Sociology, University of Edinburgh.

Miles, M. B., Farrar, E., & Neufeld, B. (1983). **Review of effective schools programs: Vol. 2. The extent of adoption of effective schools programs.** Washington, DC:.National Commission on Excellence in Education. (ED).

Miller, H. E. (1969). 'An investigation of organizational climate as a variable in pupil achievement among 29 elementary schools in an urban school district.(Unpublished doctoral dissertation,

University of Minnesota, 1968). Dissertation Abstracts, 29, 3387A.

Miller, H. E. (1980). 'Raising low socio-economic/minority school achievement: Overcoming the effects of student sense of academic futility.' **Michigan Academician**, 12(4), 437-453.

Miskel, C., McDonald, D., & Bloom, S. (1983). 'Structural and expectancy linkages within schools and organizational effectiveness.' **Educational Administration Quarterly,** 19(1), 49-82.

Mitchell, J. V., Jr. (1967). **A study of high school learning environments and their impact on students** (Report, U.S. Office of Education, Project No. 5-8032). Rochester, NY: University of Rochester.

Mitchell, J. V., Jr. (1968). 'Dimensionality and differences in the environmental press of high schools.' **American Educational Research Journal,** 5, 513-530.

Mood, A. M., Weinfield, F. D., &.York, R. L. (1966). **Equality of educational opportunity**. Washington: National Center for Educational Statistics, Office of Education.

Moos, R. H. (1974). 'Systems for the assessment and classification of human environments: An overview.' In R. H. Moos & P. M. Insel.(Eds.), **Issues in social ecology.** Palo Alto, CA: National Press Books.

Morris, V. C., Crowson, R. L., Hurqitz, E., & Porter-Gehrie, C. (1981). **The urban principal: Discretionary decision-making in a large educational organization.** Chicago: University of Illinois at Chicago Circle, College of Education.

Morrish, L. (1976). **Aspects of educational change.** London: George Allen & Unwin.

Mortimore, P., Sammons, P., Stoll, L., Lewis, D., and Ecob, R. (1986). **The Junior School Project Parts A-C.** London: ILEA, Research and Statistics Branch.

Murnane, R. J. (1981). 'Interpreting the evidence on school effectiveness.' **Teachers College Record**, 83, 19-35. National Audit Office. (1985, October).

Neter, J., W. Wasserman, and M. Kutner (1985). **Applied Linear Models**. Illinois: Richard D. Irwin Inc.

New York State Department, Bureau of School Programs Evaluation (1976). **Which school factors relate to learning? Summary of findings of three sets of studies**. Albany, NY: Author.(ERIC Document Reproduction. Service No. ED 126 613).

Newsam, P. (1978). 'Consequences of falling school enrolments: an education officer's view.' **Sheffield Papers in Educational Management**, No. 1.

Noell, J (1982). 'Public and catholic schools: a reanalysis of "Public and Private Schools". ' **Sociology of Education**, 55, 123-132.

Nuttall, D. L. (1981, February). **School self-evaluation: Accountability with a human face?.** Report and commentary on a Schools Council conference, Stoke Rochford.

Orlans, H. (1952). **Stevenage**. London: Routledge & Kegan Paul.

Pascal, A., Pauly, E., & Zellman, G. (1976). **Analysis of the school preferred reading program in selected Los.Angeles minority schools.** Santa Monica, CA: The Rand Corporation.

Paterson, H. M. (1983). 'Incubus and ideology: the development of secondary schooling in Scotland, 1900-1939.' In. W. Humes and H. Paterson (Eds.), **Scottish Culture and Scottish Education 1800-1980.** Edinburgh: John Donald.

Payne, G. and Ford, G.(1977). 'Religion, class and educational policy.' **Scottish Educational Studies**, 9(2).

Persell, C. H. (1977). **Education and inequality: A theoretical and empirical synthesis.** New York: Free Press.

Peters, T., & Waterman, R. (1982). **In search of excellence: Lessons from America's best-run companies**. New York: Harper and Row.

Phi Delta Kappa. (1980). **Why do some urban schools succeed? The Phi Delta Kappa study of exceptional urban elementary schools.** Bloomington, IN.

Phillips, D., Davie, R., & Callely, E. (1985). 'Pathways to institutional development in secondary schools.' In.D. Reynolds.(Ed.), **Studying school effectiveness.** (pp. 155-175). Lewes: Falmer.

Pincus, J. (1974). 'Incentives for innovation in the public schools.' **Review of Educational Research**, 44, 113-144.

Plowden, B. (Chairman). (1966). **Children and their primary schools**.(A report of the Central Advisory Council for Education). London: HMSO, Longmans.

Purkey, S. C., & Smith, M. S. (1983). 'Effective schools: A review.' **The Elementary School Journal**, 83 (4), 427-452.

Rachman-Moore, D. and R. Wolfe (1984). 'Robust analysis of a nonlinear model for multilevel educational survey data.' **Journal of Educational Statistics,** 9 (4), 277-293.

Ralph, J. H., & Fennessey, J. (1983). 'Science or reform: Some questions about the effective schools model. **'Phi Delta Kappan**, 64, 689-694.

Raudenbush, S. and A. Bryk (1986).' A hierarchical model for studying school effects.' **Socioloy of Education**, 59, 1-17.

Raudenbush, S. and Bryk, A. (1987). 'Quantitative models for estimating teacher and school effectiveness.' Paper presented at the Invitational Conference of the Center for Student Testing, Evaluation, and Standards, Princeton, New Jersey.

Reynolds, D. (1976a). "The'delinquent school'." In.P. Woods (Ed.), **The process of schooling.** London: Routledge and Kegan Paul.

Reynolds, D. (1976b). 'When pupils and teachers refuse a truce: The secondary school and the creation of delinquency.' In.G. Mungham & G. Pearson (Eds.), **Working class youth culture.** London: Routledge and Kegan Paul.

Reynolds, D. (1982). 'School effectiveness research - a review of the literature.' **School Organization and Management Abstracts**, 1, 5-14.

Reynolds, D. (1982). 'The search for effective schools.' **School Organization**, 2, 215-237.

Reynolds, D., &.Murgatroyd, S. (1977). 'The sociology of schooling and. the absent pupil: The school as a factor in the generation of truancy.' In H. C. M. Carroll.(Ed.), **Absenteeism in South Wales: Studies of pupils, their homes and their secondary schools.** Swansea: University College of Swansea, Faculty of Education.

Reynolds, D. and Reid, K. (1985). 'The second stage: towards a reconceptualization of theory and methodology in school effectiveness research.' In. D. Reynolds. (Ed.), **Studying School Effectiveness**, Lewes, Sussex: Falmer Press.

Rist, R. C. (1970). 'Student social class and teacher expectations: a self-fulfilling prophesy in ghetto education.' **Harvard Educational Review**, 40, 411-451.

Robinson, W.S. (1950). 'Ecological correlations and the behavior of individuals.' **American Sociological Review,** 15, 351-357.

Rogers, E. M., & Shoemaker, F. F. (1971). **Communication of innovations: A cross-cultural approach** (2nd ed.). New York: The Free Press.

Rosenthal, R., &.Jacobson, L. (1968). **Pygmalion in the classroom.** New York: Holt, Rinehart, & Winston.

Rowan, B., & Miracle, A. W., Jr. (1983). 'Systems of ability grouping and the stratification of achievement in elementary schools.' **Sociology of Education,** 56(3), 133-144.

Rowan, B., Bossert, S. T., & Dwyer, D. C. (1983). 'Research on effective schools: A cautionary note.' **Educational Researcher,** 12 (4), 24-31.

Rutter, M., B. Maughan, P. Mortimore, and J. Ouston (1979). **Fifteen Thousand Hours**. London: Open Books.

Sarason, S. G. (1971). **The culture of the school and the problem of change.** Boston, MA: Allyn & Bacon.

Scheerer, H. (1981). 'Choice schemes and the quality of school life in West German comprehensive schools.' In J. L. Epstein (ed), **The Quality of School Life**, Lexington Books: Toronto.

Schmidt, W. H. (1983). 'High school course-taking: A study of variation. '**Journal of Curriculum Studies**, 15(2), 167-182.

Schneider, J. M., Glasheen, J. D., & Hadley, D. W. (1979). 'Secondary school participation, institutional socialization, and student achievement.' **Urban Education**, 14, 285-302.

Scotland, J. (1969a). **The History of Scottish Education: Volume 1. From the Beginning to 1872**. London: University of London Press.

Scotland, J. (1969b). **The History of Scottish Education: Volume 2. From 1872 to the Present Day**. London: University of London Press.

Scottish Education Department (1947). **Secondary Education: A Report of the Advisory Council on Education in Scotland**. Edinburgh: HMSO. (Cmd. 7005).

Scottish Education Department. (1972). **Structure of promoted posts in secondary schools in Scotland.** (Circular No. 826). Edinburgh: HMSO.

Scottish Education Department. (1984). **Learning and teaching in Scottish secondary schools: School management**. HMI Report Edinburgh: HMSO.

Scottish Education.Department. (1983). **Teaching and learning in the senior stages of the Scottish secondary school: A report by HM Inspectors of Schools.** Edinburgh: HMSO.

SED (1947).**Secondary Education: A Report of the Advisory Conuncil on Education in Scotland**. HMSO: Edinburgh.

Slavin, R. E. (1980). 'Cooperative learning.' **Review of Educational Research,** 50, 315-342.

Slavin, R. E. (1983a). **Cooperative learning**. New York: Longman.

Slavin, R. E. (1983b). 'When does cooperative learning increase student achievement?' **Psychological Bulletin**, 94 429-445.

Slavin, R. E., & Karweit, N. L. (1985). 'Effects of whole class, ability grouped, and individualized instruction on mathematics achievement.' **American Educational Research Journal**, 22(3), 351-367.

Sorensen, A. B., and Hallinan, M. T. (1986). 'The effects of ability grouping on growth in academic achievement.' **American Educational Research Journal,** 23, 519-542.

Stallings, J. A. (1980). 'Allocated academic learning time revisited, or beyond time on task.' **Educational Researcher,** 9, 11-16.

Steedman, J (1980). **Progress in Secondary Schools: Findings from the National Child Development Study.** London: National Children's Bureau.

Steedman, J (1980). **Progress in Secondary Schools: Findings from the National Child Development Study.** London: National Children's Bureau.

Steedman, J (1983). **Examination Results in Selective and Non-selective Schools.** London: National Children's Bureau.

Steedman, J. (1984). **Examination results in mixed and single-sex schools: Findings from the National Child Development Study.** Manchester: Equal Opportunities Commission.

Strathclyde Department of.Education. (1981). (Report). **Falling school rolls and curriculum contraction: the myth and reality.**

Strivens, J. (1985). 'School climate: A review of a problematic concept.' In D. Reynolds.(Ed.), **Studying school effectiveness**.(pp. 45-56). Lewes: Falmer.

Summers, A. A. & B. L. Wolfe (1979). 'Which school resources help learning ? Efficiency and equity in Philadelphia public schools.' **IRCD Bulletin**, 11, 1-15.

Sutherland, G. (1971) **Elementary education in the nineteenth century**. London:London Historical Association.

Tagiuri, R. (1968). 'The concept of organizational climate.' In R. Tagiuri. &.G. H. Litwin.(Eds.), **Organizational climate: Exploration of a concept.** Boston: Harvard University, Division of Research, Graduate School of Business Administration.

Torrance, H. (1986).'What can examinations contribute to school evaluation.' **Educational Review**, 38, 31-43.

Treble, J. H. (1972). 'The developement of Roman Catholic Education in Scotland 1878 - 1978.' **Innes Review**, 31, 111-139.

Tukey, J. W. (1977). **Exploratory Data Analysis.** Reading, Mass: Addison-Wesley.

Turner, R. H. (1960). 'Sponsored and contest mobility and the school system.' **American Sociological Review,** 25, 855-867.

Turner, G. (1983). **The social world of the comprehensive school.** London: Croom Helm.

Turner, G., & Clift, P. (1985). **A first review and register of school and college based teacher appraisal schemes**. Open University Press.

Tye, K. A. (1974). 'The culture of the school.' In. J. I. Goodlad, M. F. Klein, J. M. Novotnew, & K. A. Tye.(Eds.), **Towards a mankind school: An adventure in humanistic education.** New York: McGraw-Hill.

United States Government (1983). **A nation at risk: the imperative for educational reform.** National Commission on Excellence in Education. U.S. Government Printing Office: Washington, D.C.

Velleman, P. and D. Hoaglin (1981). **Applications, basics, and computing of exploratory data analysis**. Boston: Duxbury Press.

Venezky, R. L., &.Winfield, L. F. (1979). **Schools that succeed beyond expectations in reading.** (Studies on Education Technical Report No. 1) Newark: University of Delaware. (ERIC.Document Reproduction Service. No. ED 177 484). ***

Wade, N. (1939).**Post-Primary Eductation in the Primary Schools of Scotland 1872-1936**. London: University of London Press.

Weatherley, R., &.Lipsky, M. (1977). 'Street level bureaucrats and institutional innovation: Implementing special education reform.' **Harvard Educational Review**, 47, 171-197.

Weber, G. (1971). **Inner-city children can be taught to read: Four successful schools.** Washington: Council for Basic Education.

Weick, K. E. (1976). 'Educational organizations as loosley coupled systems.' **Administrative Science Quarterly**, 21, 1-19.

Welch, W. W. (1979). 'Curricular and longitudinal effects on learning environments.' In.H. J. Walberg.(Ed.), **Educational environments and effects.** Berkeley, CA: McCutchan.

Wilby, P (1987) 'Mixed ability teaching 'common in some schools' .' **The Independent**, October 23.

Wilcox, B. (1985). 'Conceptualizing curriculum differences for studies of secondary school effectiveness.' In D. Reynolds (Ed.), **Studying school effectiveness** (pp. 59-74). Lewes: Falmer.

Wiley, D. E., & Harnischfeger, A. (1974). 'Explosion of a myth: Quantity of schooling and exposure to instruction, major educational vehicles.' **Educational Researcher**, 3(4), 7-12.

Williams, T. (1976). 'Teacher prophesies and the inheritance of inequality.' **Sociology of Education**, 49(3), 223-235.

Willms, J.D. (1984). 'School effectiveness within the public and private sectors.' **Evaluation Review**, 8, 113-35.

Willms, J. D. (1985). 'The balance thesis: Contextual effects of ability on pupils' O-grade examination results.' **Oxford Review of Education**, 11(1), 33-41.

Willms, J. D. (1986). 'Contextual effects of school socio-economic status on Scottish pupils' examination results.' **American Sociological Review.**(forthcoming).

Willms, J. D. (1987). 'Differences between Scottish educational authorities in their examination attainment.' **Oxford Review of Education**, 13, 211-32.

Willms J. and P. Cuttance (1985). 'School effects in Scottish secondary schools.' **British Journal of Sociology of Education**, 6 (3), 289-306.

Wiseman, S. (1967). 'The Manchester survey. 'In **Children and their primary schools** (Plowden Report). Report of the Central Advisory Council for Education, HMSO, app. 9.

Wolcott, H. (1973). **The man in the principal's office**. New York: Holt, Rinehart, & Winston.

Wynne, E. A. (1980). **Looking at schools: Good, bad, and indifferent.** Lexington, MA: D. C. Heath.